Washington State Department of Health

# COVID-19 VACCINE UPDATES WEBINAR - MARCH

March 31, 2021
Hosted by the Washington Department of Health

# Before We Start…

- All participants will be muted for the presentation.
- You may ask questions using the Q&A box, and questions will be answered at the end of the presentation.
- Continuing education is available for nurses, medical assistants, and pharmacists attending the webinar or watching the recording. If you're watching in a group setting and wish to claim CE credit, please make sure you register for the webinar as an individual and complete the evaluation separately.
- You can find a copy of the slides and more information on our webinar page here: www.doh.wa.gov/YouandYourFamily/Immunization/ImmunizationNews/ImmunizationTraining/COVID19VaccineUpdatesWebinarMarch

# Presenters

**Ed Marcuse, MD, MPH, FPIDS**

*Emeritus Professor, Pediatrics*

University of Washington

**John Dunn, MD, MPH, FAAP**

*Medical Director of Preventive Care*

Kaiser Permanente

# Continuing Education Disclosure

- The planners and speakers of this activity have no relevant financial relationships with any commercial interests pertaining to this activity.
- Information about obtaining CEs will be available at the end of this webinar.

# Continuing Education

- This continuing nursing education activity was approved by the Montana Nurses Association, an accredited approver with distinction by the American Nurses Credentialing Center's Commission on Accreditation. Upon successful completion of this activity, 1.0 contact hours will be awarded.
- This program has been granted prior approval by the American Association of Medical assistants (AAMA) for 1.0 administrative continuing education unit.
- This training was approved by the Washington State Pharmacy Quality Assurance Commission (PQAC) for pharmacist education. Upon successful completion of this activity, 1.0 credit hour of continuing education will be awarded.

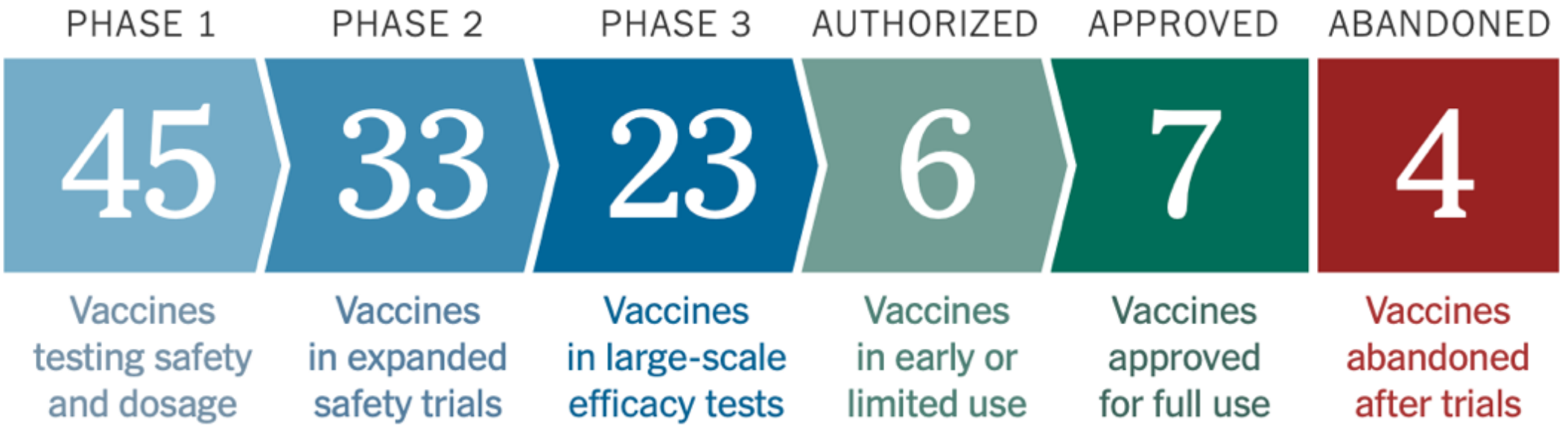
# CURRENT AND UPCOMING COVID-19 VACCINES SAFETY AND EFFECTIVENESS DATA

DR. MARCUSE

# OUTLINE

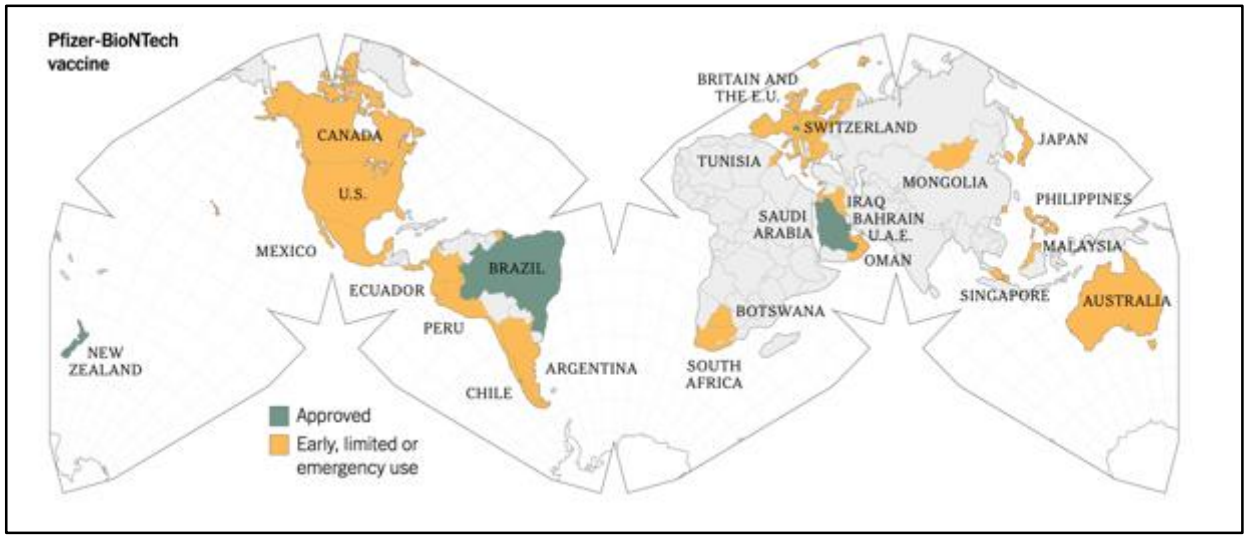
1. COVID-19 Vaccine Development
2. Terminology & US Authorization Process
2. mRNA Vaccines:  Safety & Efficacy
3. Viral Vector & Protein Vaccines
4. Variants
5. Unknowns

# COVID-19 VACCINE DEVELOPMENT WORLDWIDE

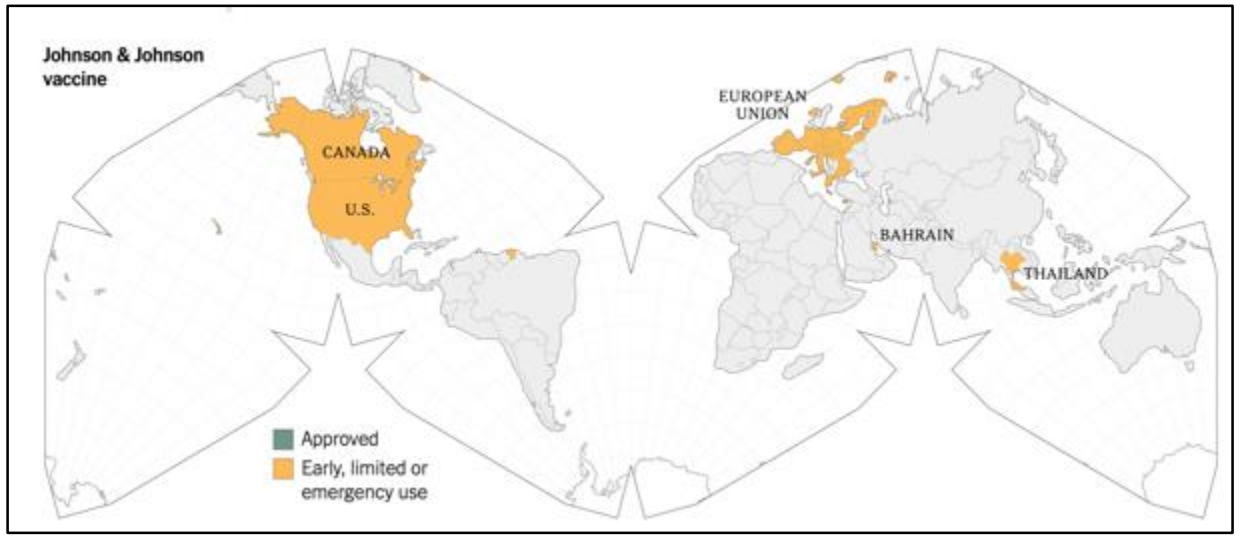



Source*: NY Times Vaccine Tracker 3-25-2021*

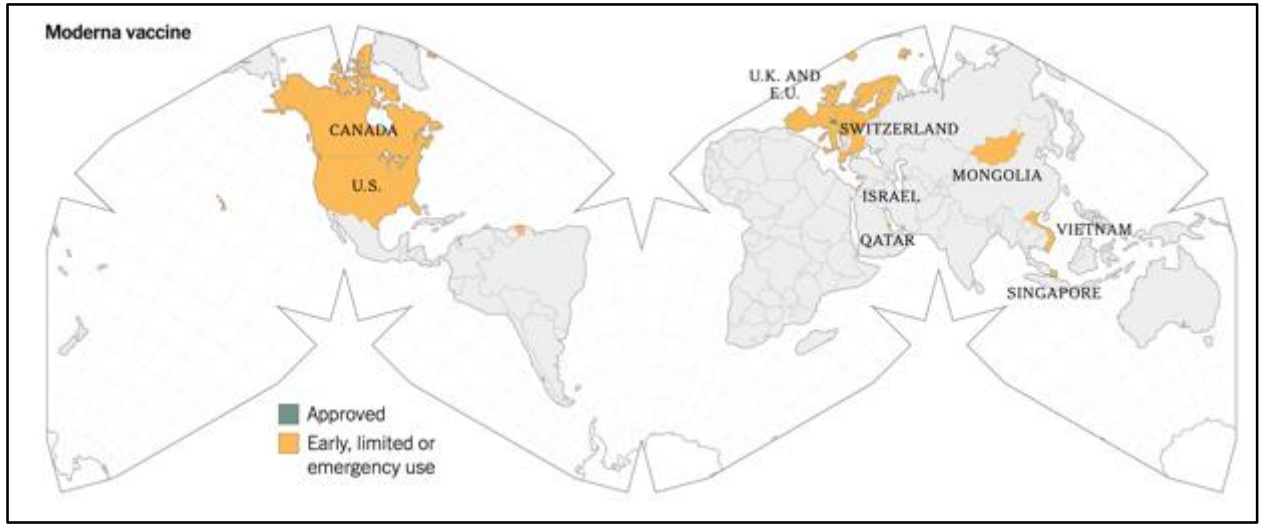
## PFIZER



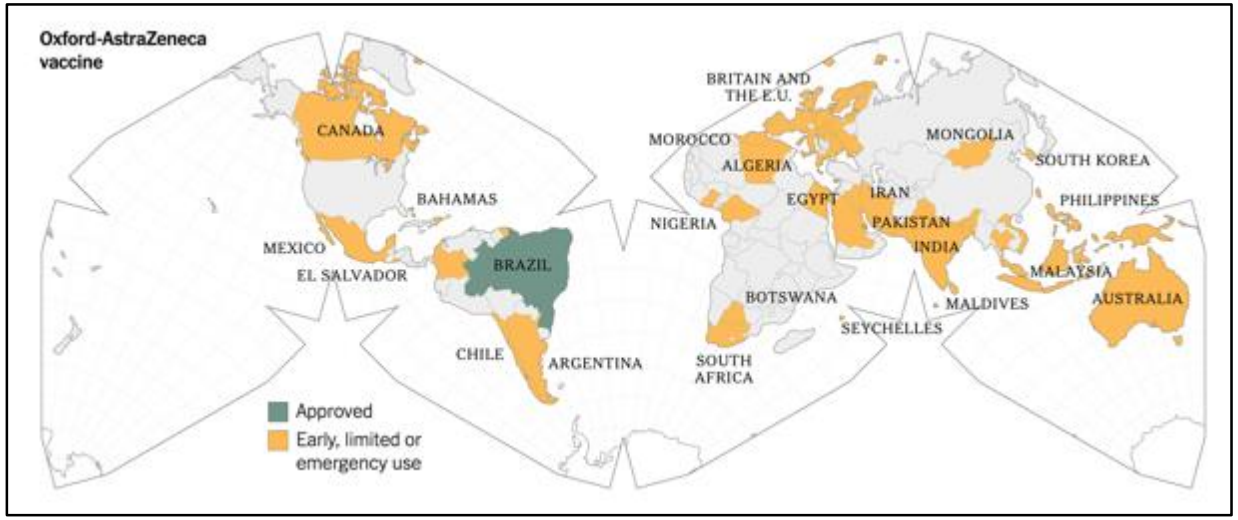

## JANSSEN - JOHNSON & JOHNSON



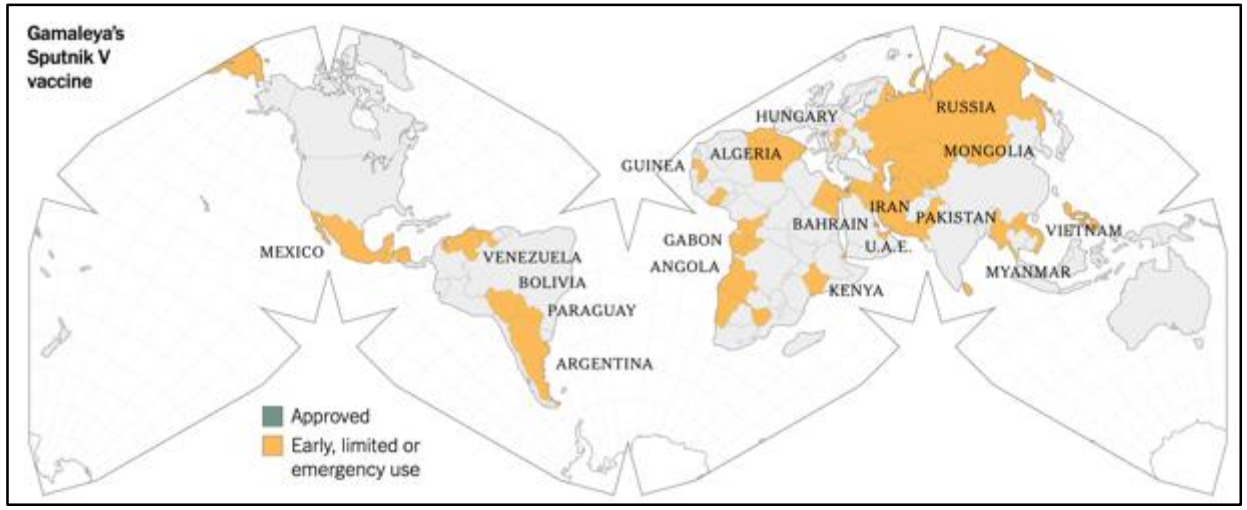

## MODERNA




## ASTRAZENECA



## GAMALEYA SPUTNIK V

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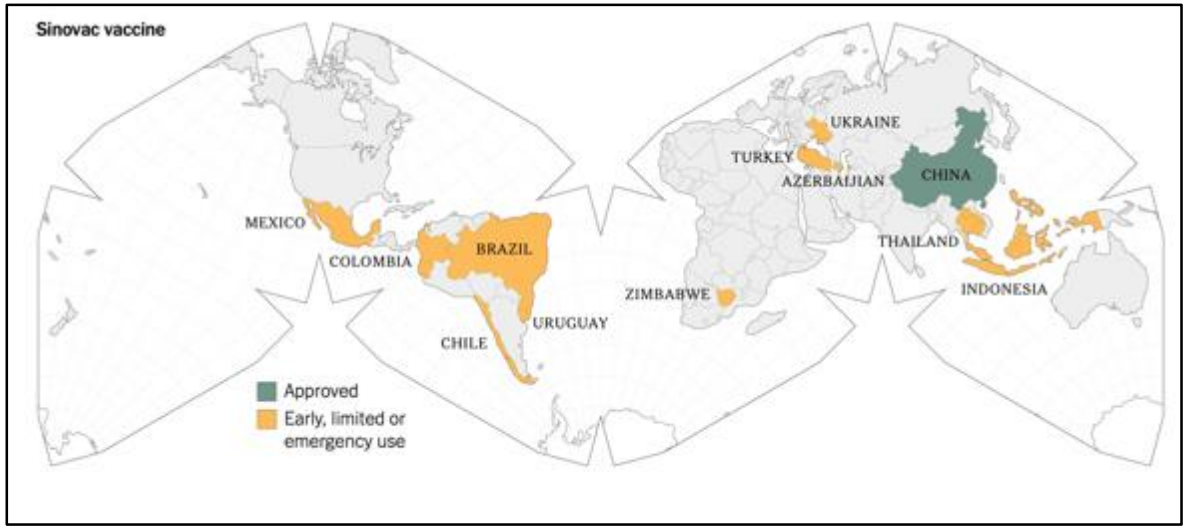
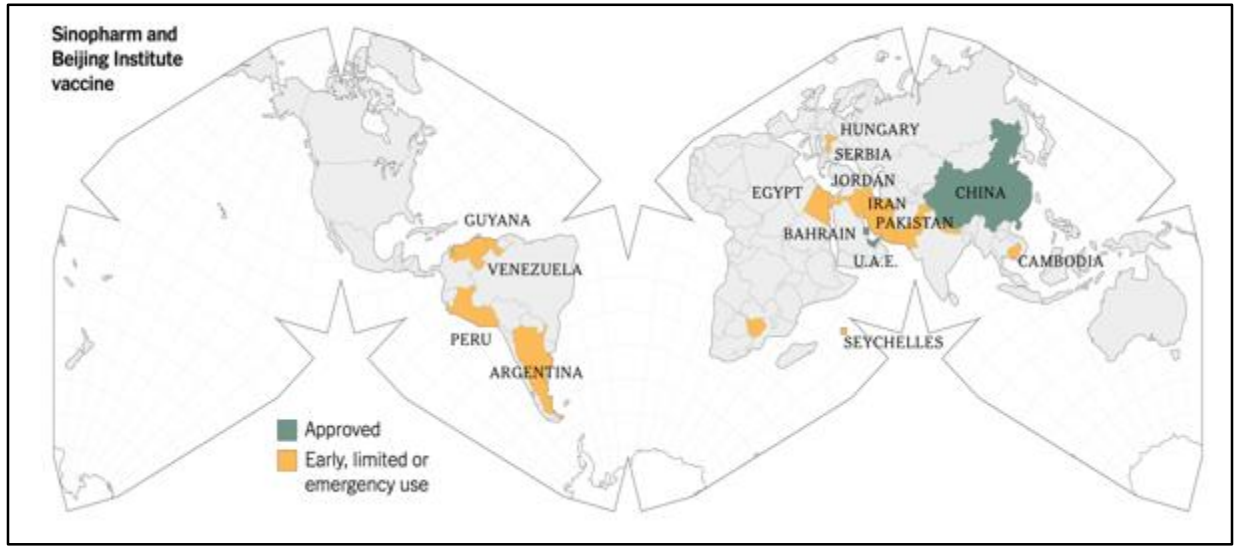
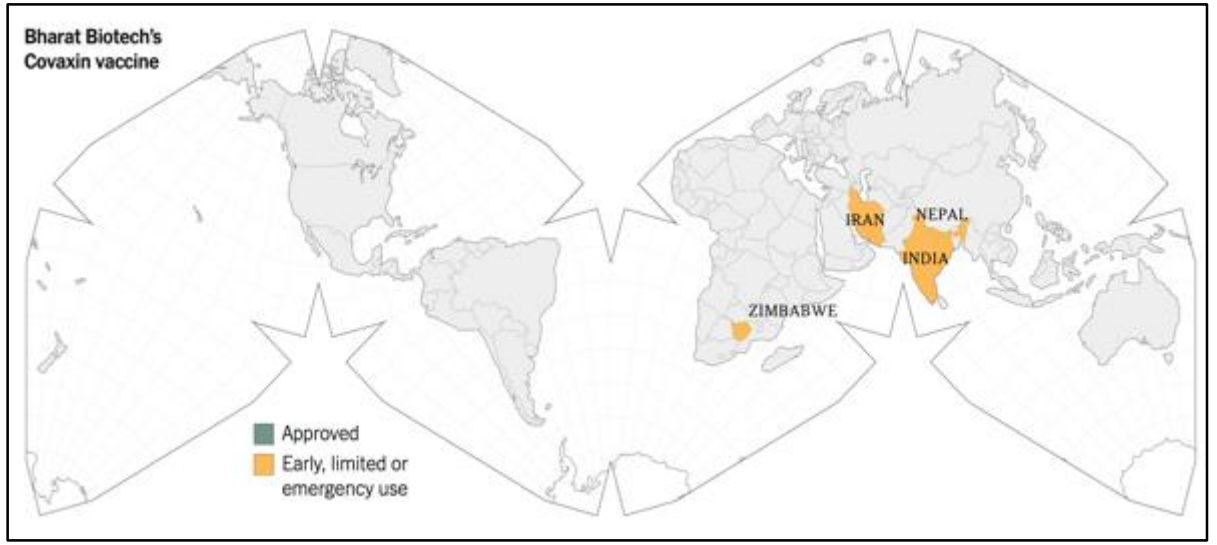



## SINOPHARM & BEIJING INSTITUTE




## BHARAT BIOTECH COXAVIN



# VACCINE RISK, SAFETY, EFFICACY & EFFECTIVENESS

**Vaccine Risk:**

Expected local & systemic reactions

Adverse events (AE): Non-serious & Serious (SAE*)

- Initial temporal association, analysis required to determine causality

**Vaccine Safety:**

Relative, not absolute: consider in the context of disease risk

- Clinical trials vs post-distribution reports

**Vaccine Efficacy & Effectiveness:**

Infection, mild, moderate & severe disease; hospitalization, death

Efficacy against variants; symptomatic & asymptomatic reinfection

*SAE: hospitalization, life-threatening, persistent disability, death

# FEDERAL VACCINE ADVISORY COMMITTEES

**VRBPAC** FDA Vaccines & Related Biologic Products Advisory Committee

*Licensing & authorization of vaccines, biologicals, drugs*

**ACIP** CDC Advisory Committee on Immunization Practices

*Recommendations for the use of FDA-approved vaccines*

Members: *diverse expertise, vetted for COI, independent, defined terms*
Meetings: *public, agenda & presentations posted online*

# WESTERN STATES VACCINE SAFETY REVIEW GROUP (WSSRG)

CA, NV, OR & WA Governors appointed WSSRG to conduct independent review of vaccine safety, efficacy, review process & recommendations

Members: *11 from CA, 2 each from NV, OR, WA; 9 are former/present members ACIP, VRBPAC, NVAC*
Meetings: *at request of state health depts, governors; reports to governors published online*

# BIOLOGICAL LICENSE APPLICATION (BLA)
# EMERGENCY USE AUTHORIZATION (EUA)

## BLA

Usual licensing process

Requires ≥ 6 mos follow-up data*

FDA *approves* as *safe & effective*

## EUA

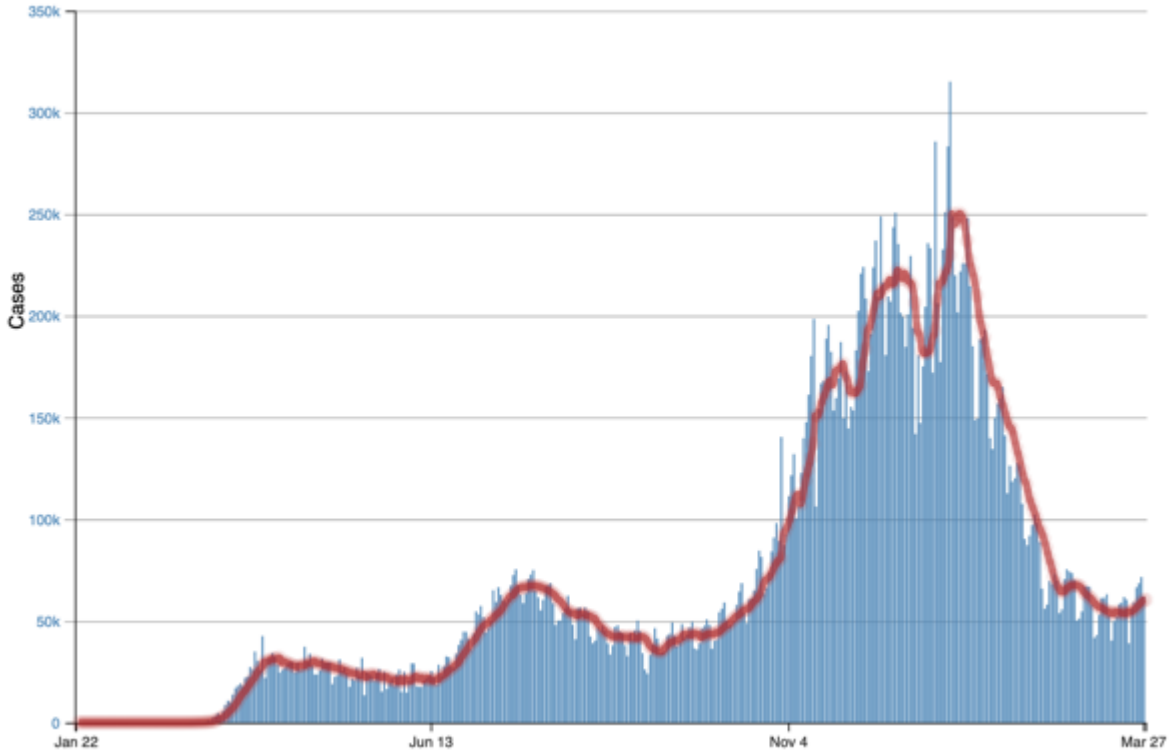
Allows distribution or off-label emergency use

FDA *finds* the *benefits outweigh the risks*

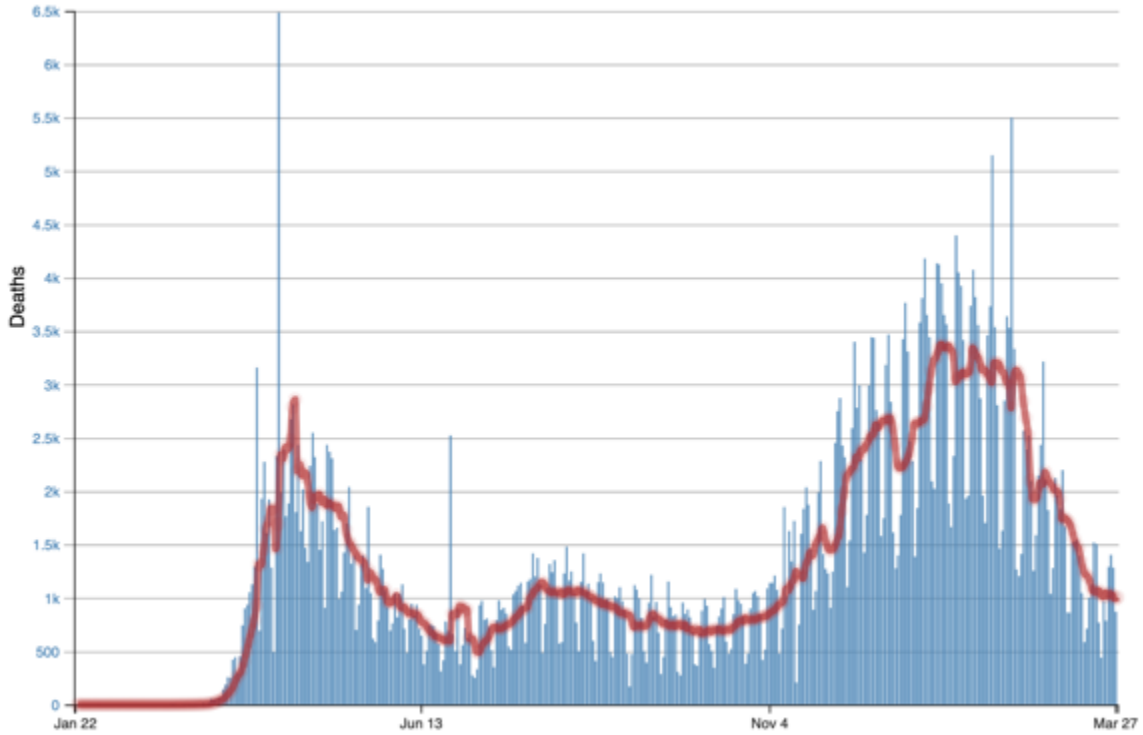
**AE associated with licensed US vaccines occurred within 8 weeks of vaccine administration*

# CONTINUING PUBLIC HEALTH EMERGENCY
## COVID-19 PANDEMIC

CASES reported CDC 1/22/2020 – 3/27/2021

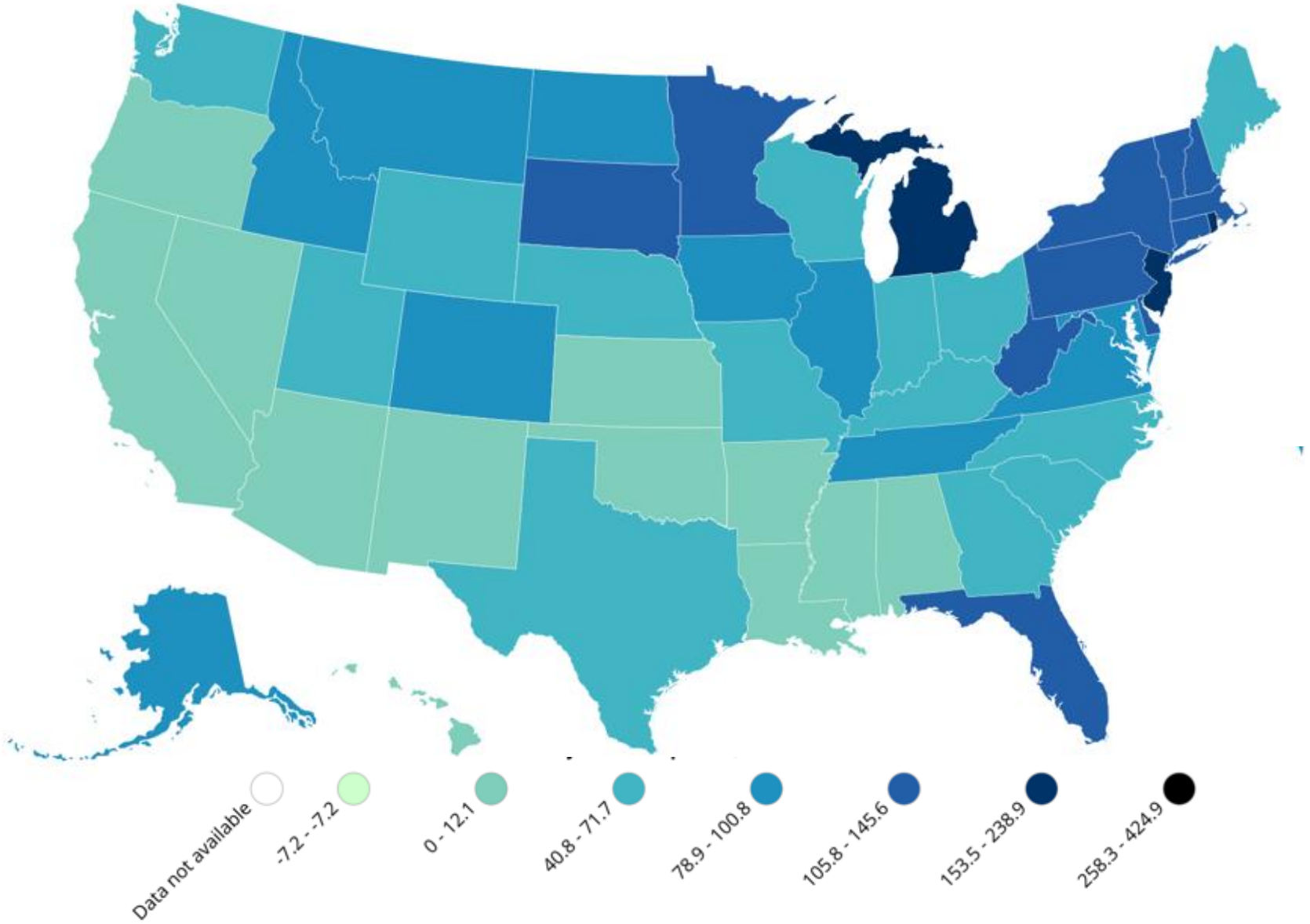



DEATHS reported CDC 1/22/2020 – 3/27/2021

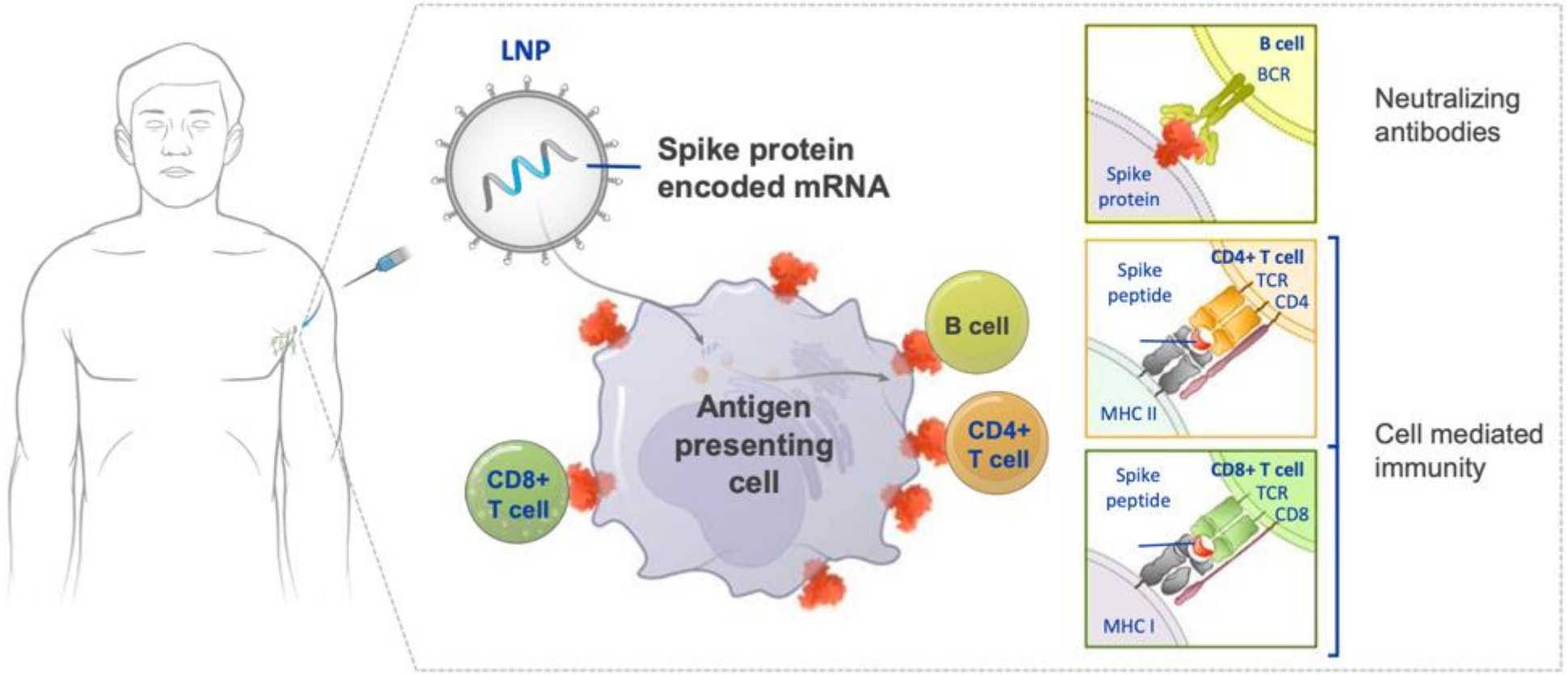



https://covid.cdc.gov/covid-data-tracker/#datatracker-home

# US COVID-19 7-DAY CASE RATE PER 100,000
(3/28/2021)



# mRNA VACCINES

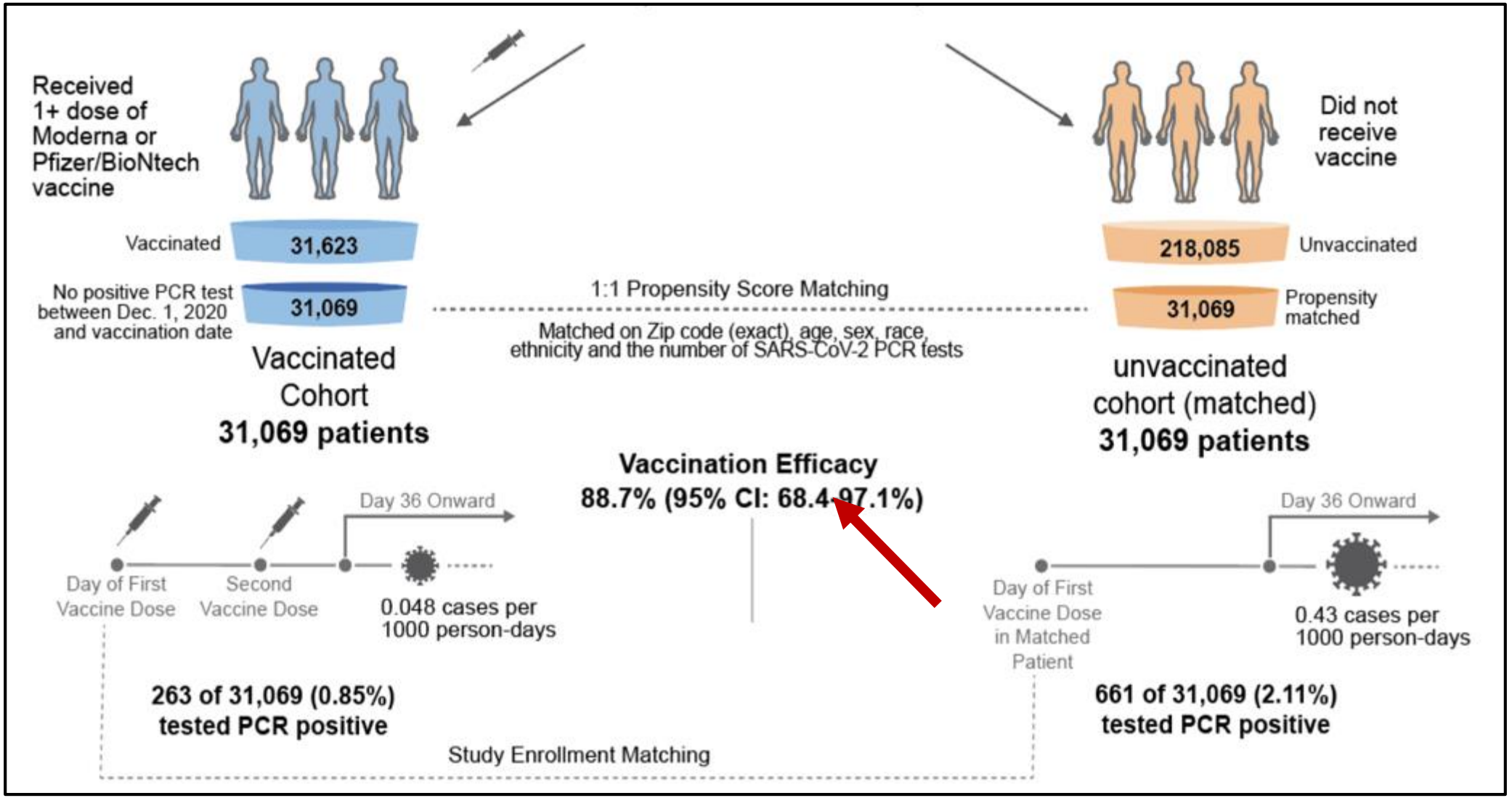



Source: https://www.fda.gov/media/144583/download

# mRNA VACCINES

- mRNA human vaccine new, 1990s technology – Ebola, Zika, rabies, CMV
- Relatively easy to produce in large quantities, no need for eggs
- mRNA vaccines do NOT contain SARS-CoV-2 virus, cannot cause disease
- mRNA inherently unstable, breaks down rapidly
- Enters the immune cell's cytoplasm, not the nucleus, not incorporated into cell's DNA
- mRNA instructs cell to make the S protein which is displayed on the cell's surface, stimulating humoral and cellular immune responses

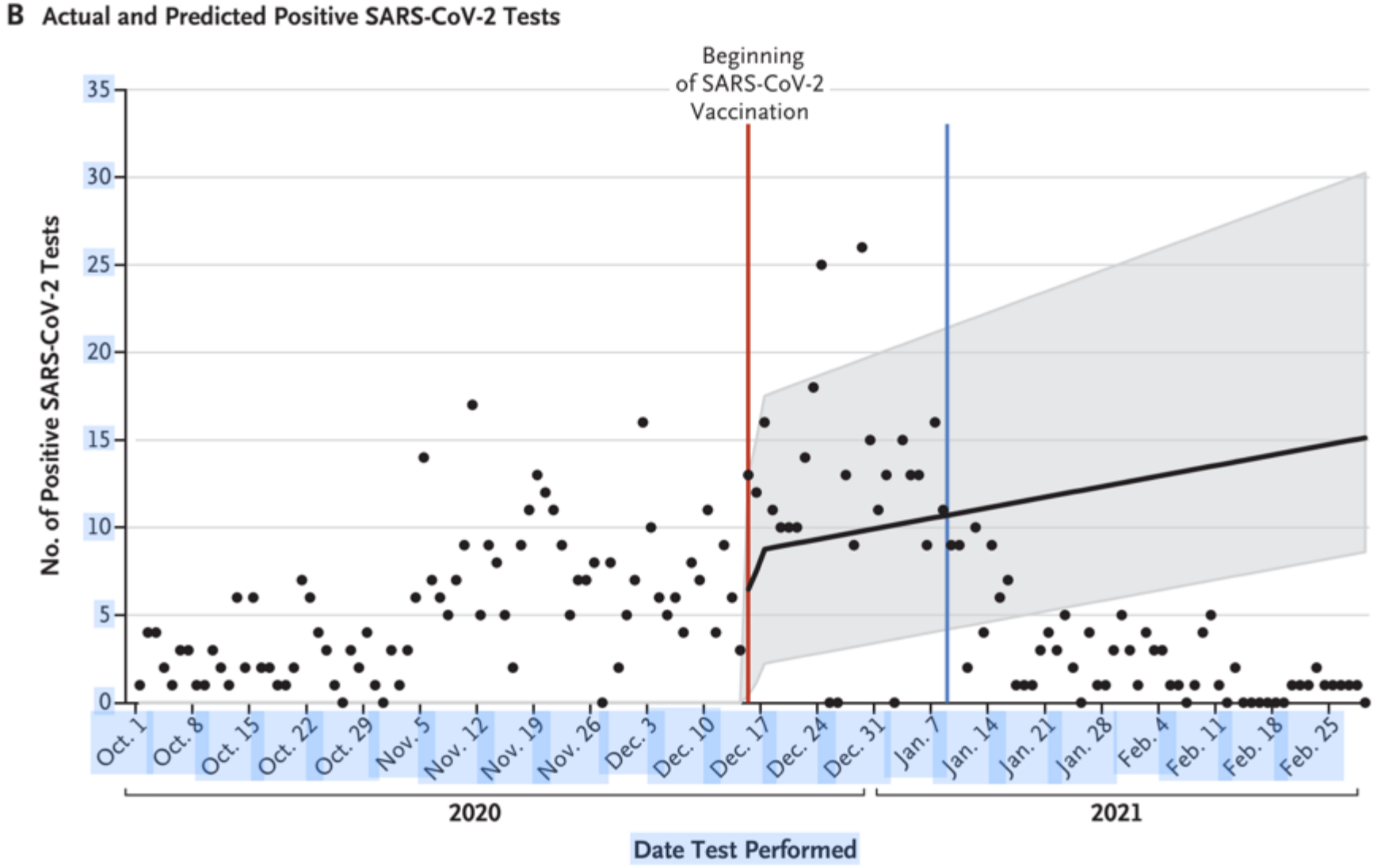
# mRNA VACCINE EFFECTIVENESS – MAYO CLINIC SYSTEM




https://www.medrxiv.org/content/10.1101/2021.02.15.21251623v1

# mRNA VACCINE EFFECTIVENESS – HEALTH CARE WORKERS

University of Texas Southwest NEJM 3/21/2021



# US VACCINE SAFETY SYSTEM

## VAERS

| AE \ VACCINE | + | - |
|---|---|---|
| + | ✓ | ? |
| - | ? | ? |

## VSD

| AE \ VACCINE | + | - |
|---|---|---|
| + | ✓ | ✓ |
| - | ✓ | ✓ |

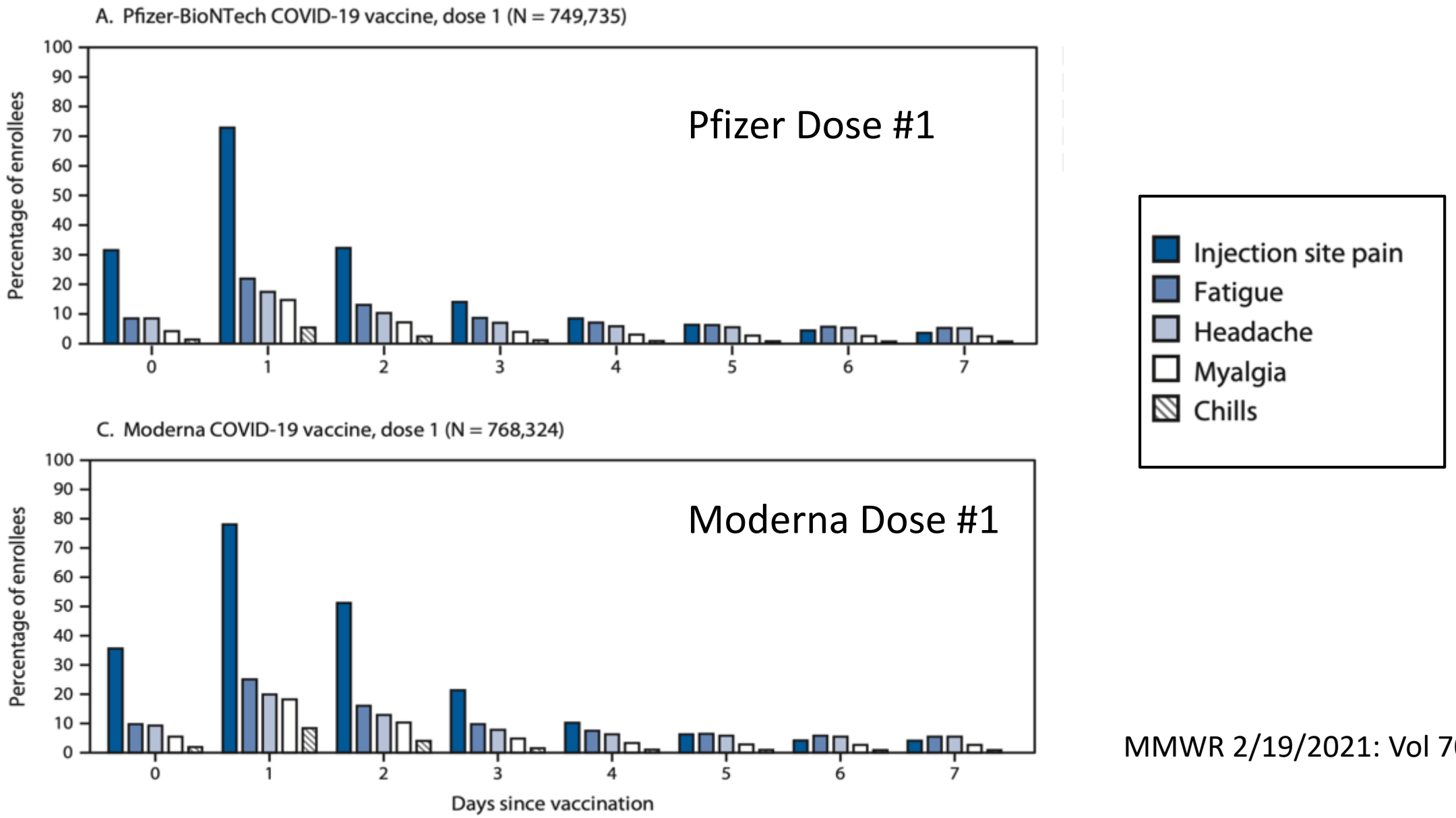
## V-SAFE

| AE \ VACCINE | + | - |
|---|---|---|
| + | ✓ | ? |
| - | ✓ | ? |

**VAERS:** Vaccine Adverse Event Reporting System
**VSD:** Vaccine Safety Datalink, formerly Large Linked Database
**V-SAFE:** Vaccine Healthchecker

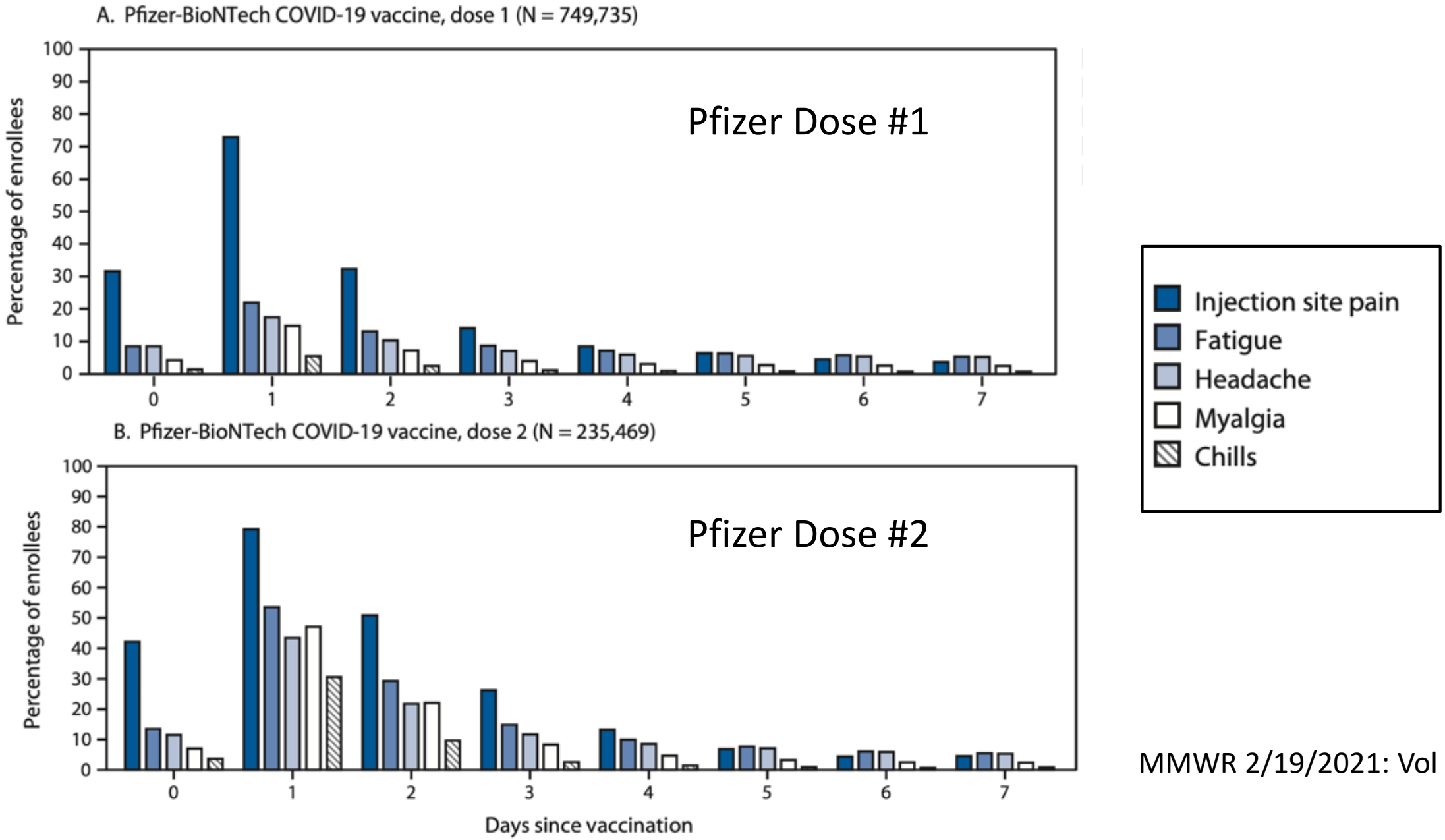
# VAERS & V-SAFE REPORTS: PFIZER vs MODERNA VACCINES

## 12/14/2020 – 1/13/2021




MMWR 2/19/2021: Vol 70:1-2

# VAERS & V-SAFE REPORTS: PFIZER DOSE #1 vs #2



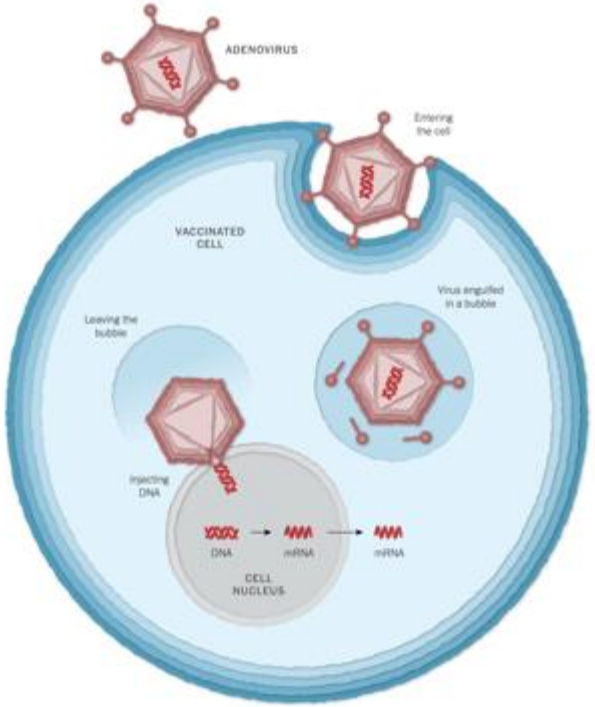

MMWR 2/19/2021: Vol 70:1-2

# V-safe pregnancy registry outcomes of interest in COVID-19 vaccinated pregnant women as of February 18, 2021*

| Outcomes | Background rates* | V-safe pregnancy registry overall |
|---|---|---|
| **Pregnancy outcome** | | |
| Miscarriage (<20 weeks) | 26% | 15%† |
| Stillbirth (≥ 20 weeks) | 0.6% | 1% |
| **Pregnancy complications** | | |
| Gestational diabetes | 7-14% | 10% |
| Preeclampsia or gestational hypertension§ | 10-15% | 15% |
| Eclampsia | 0.27% | 0% |
| Intrauterine growth restriction | 3-7% | 1% |
| **Neonatal** | | |
| Preterm birth | 10.1% | 10% |
| Congenital anomalies‡ | 3% | 4% |
| Small for gestational age^ | 3-7% | 4% |
| Neonatal death | 0.38% | 0% |

* Sources listed on slide 33; † 93% of these were pregnancy losses <13 weeks of age; § Pre-eclampsia or gestational hypertension diagnosed during pregnancy and/or during delivery; ‡ Congenital anomalies (overall) diagnosed after delivery only; ^ Birthweight below the 10th percentile for gestational age and sex using INTERGROWTH-21st Century growth standards

# VIRAL VECTOR COVID-19 VACCINES




## Janssen - Johnson & Johnson

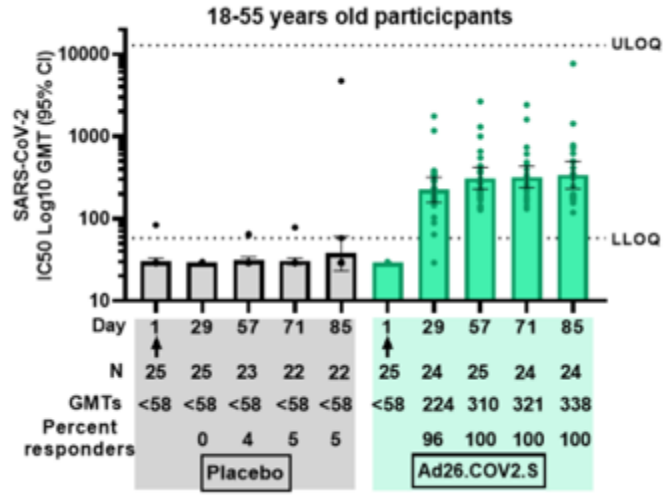
Non-replicating adenovirus 26, used in Ebola vaccine
1 dose EUA approved; 2nd dose at 57 days under study
Refrigerator-stable 3 months

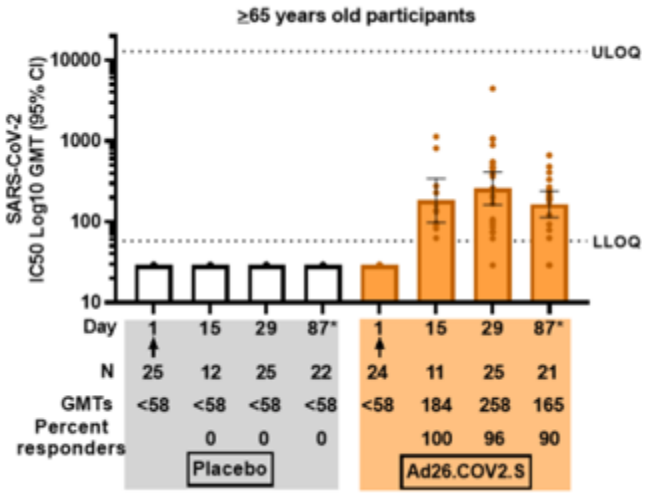
Effectiveness varies among strains:
US 72%, Latin America 66%, South Africa 57%
Overall: 66% effective against *moderate-severe* disease
85% effective against s*evere-critical* disease

ACIP & WSVSRG analyses concluded the Janssen vaccine's efficacy is comparable to the Pfizer and Moderna vaccines

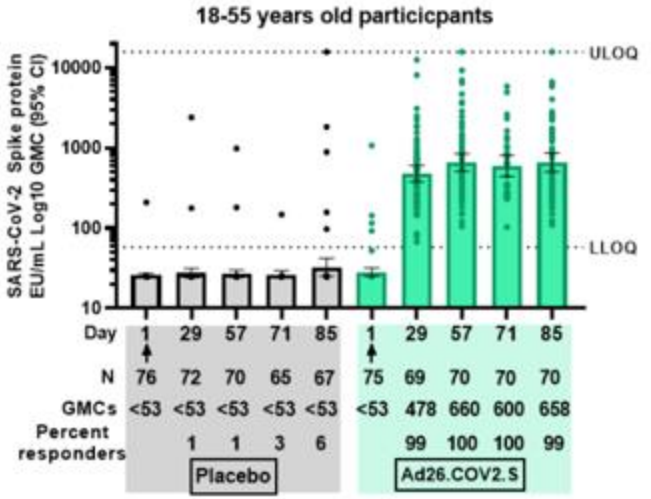
# JANSSEN VACCINE: ANTIBODY RESPONSES

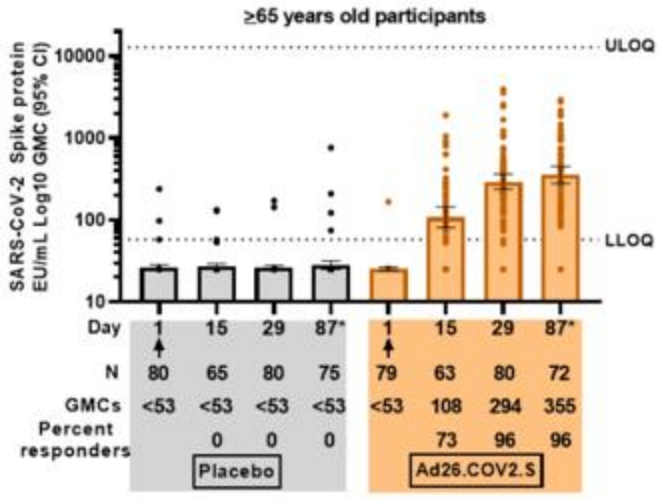
Neutralizing




Spike Protein Binding

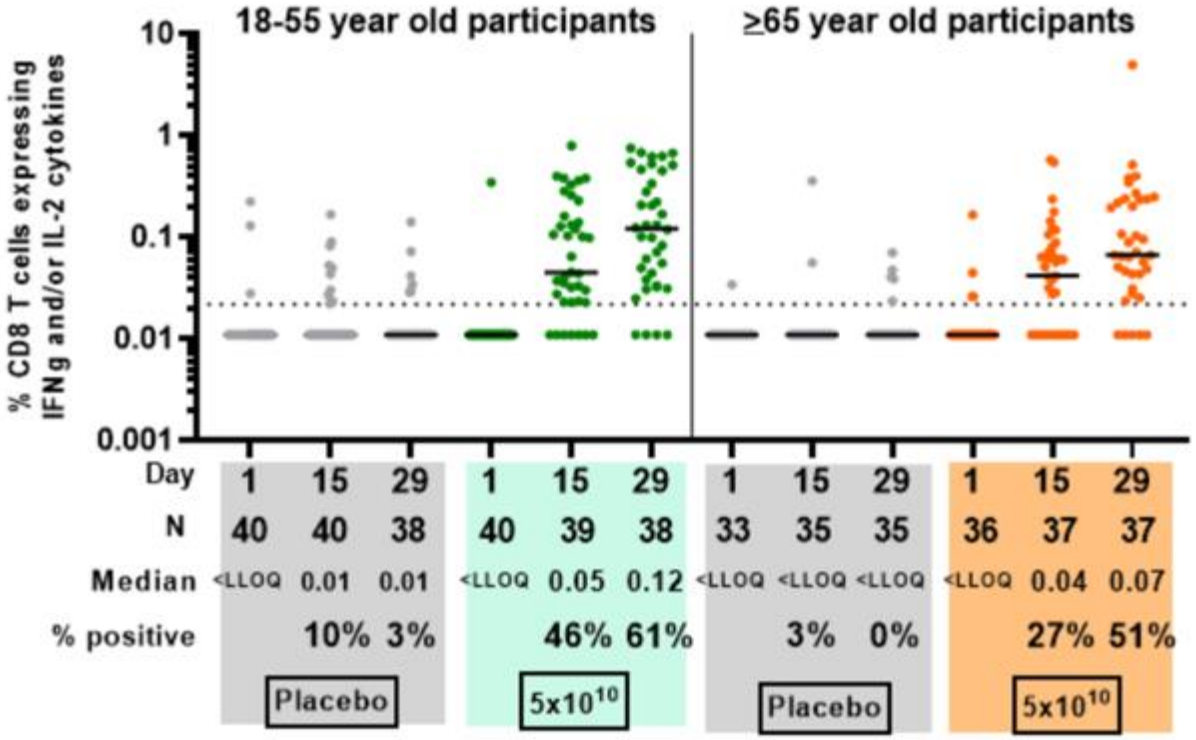


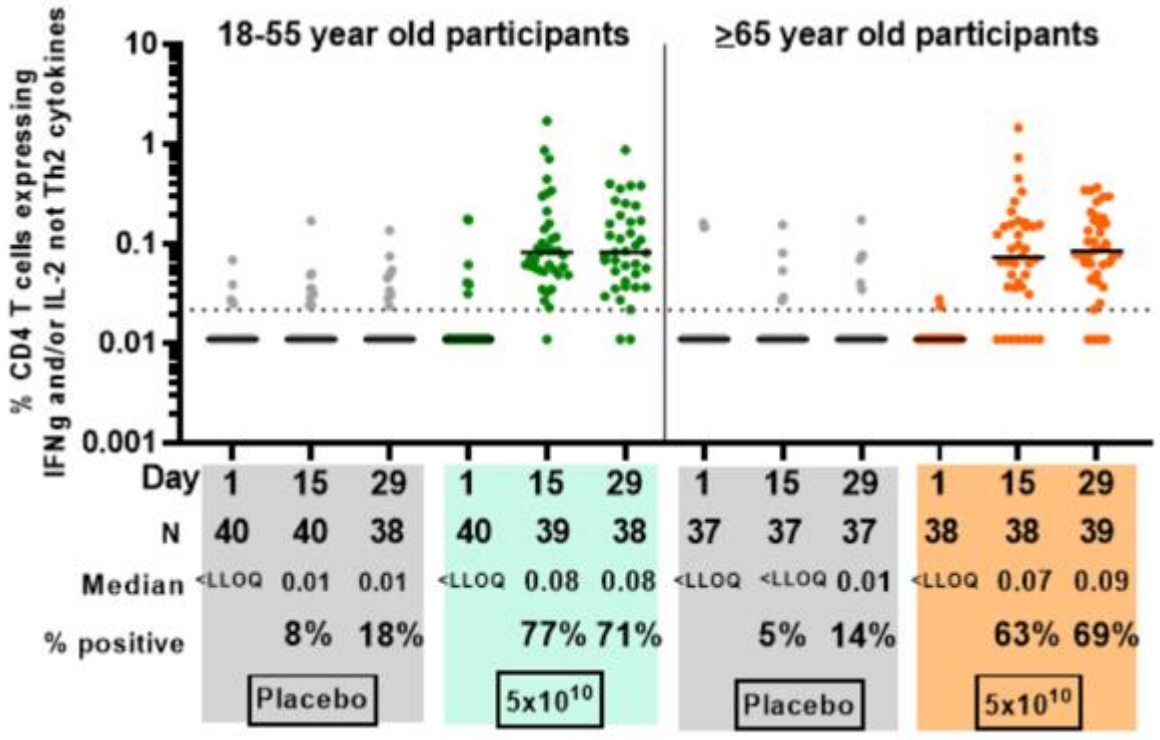

Source: Briefing Document Janssen Ad26.COV2.S Vaccine for the Prevention of COVID-19

# JANSSEN VACCINE: CELLULAR RESPONSES

## CD 8 +

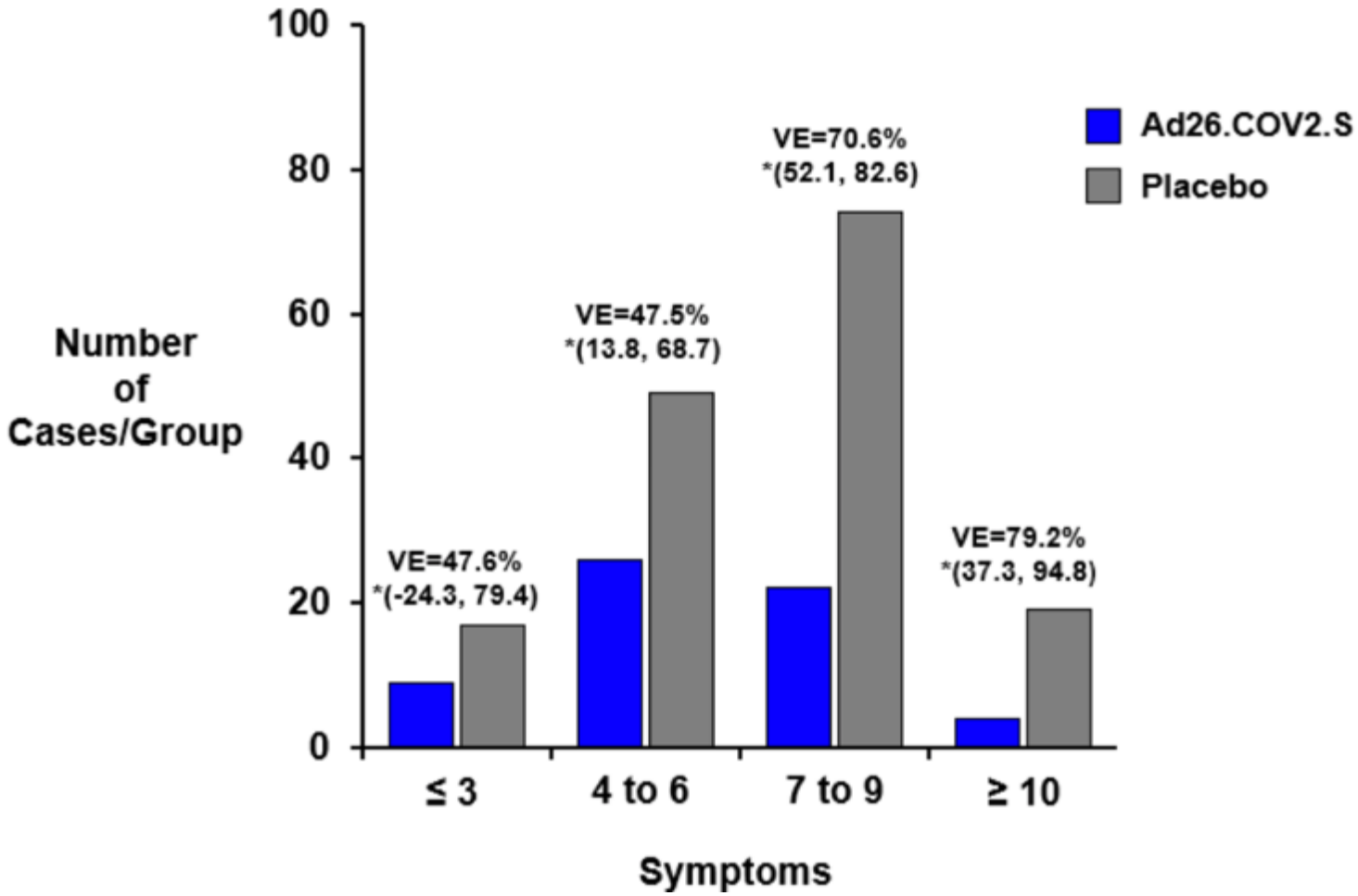



## CD 4+ Th1




Source: Briefing Document Janssen Ad26.COV2.S Vaccine for the Prevention of COVID-19

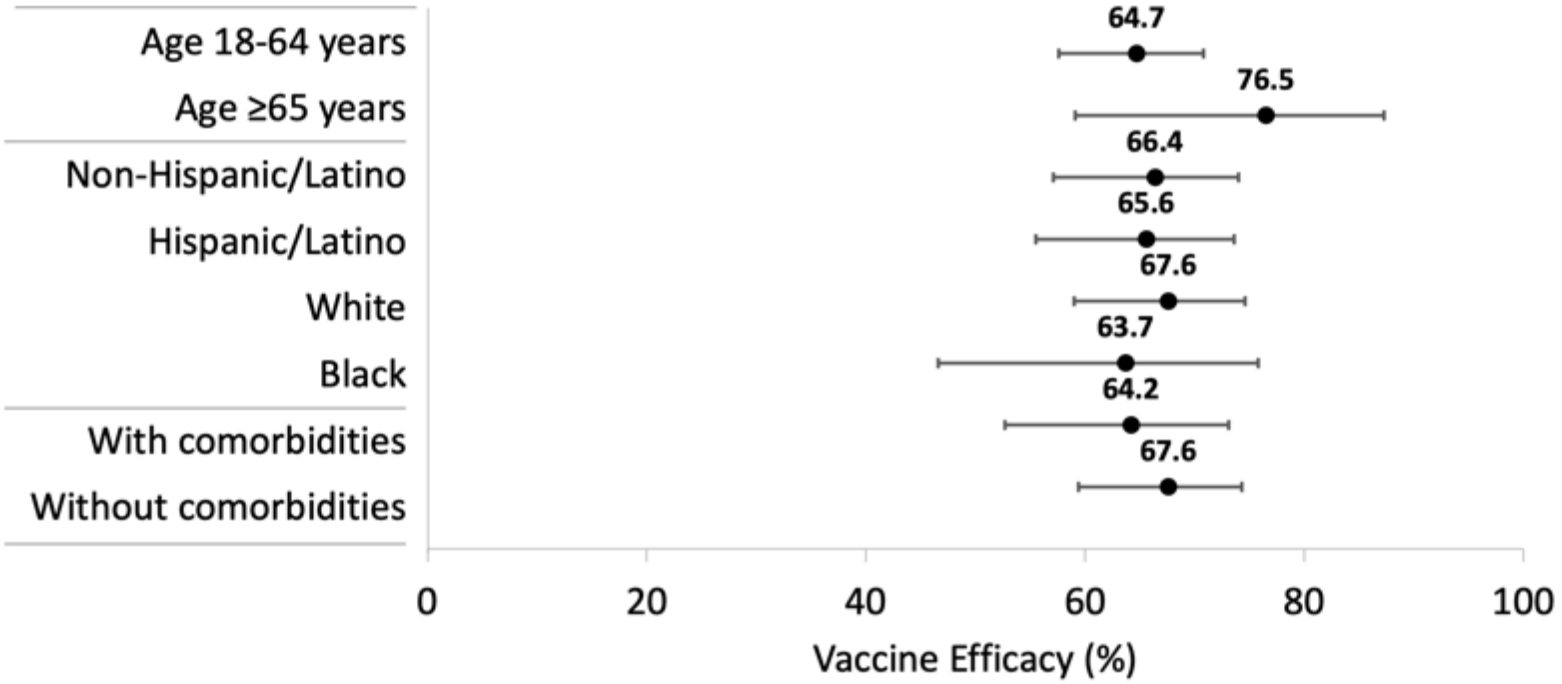
# JANSSEN VACCINE: CLINICAL TRIAL EFFICACY BY NUMBER OF SYMPTOMS




Source: Briefing Document Janssen Ad26.COV2.S Vaccine for the Prevention of COVID-19

# JANSSEN VACCINE: CLINICAL TRIAL EFFICACY

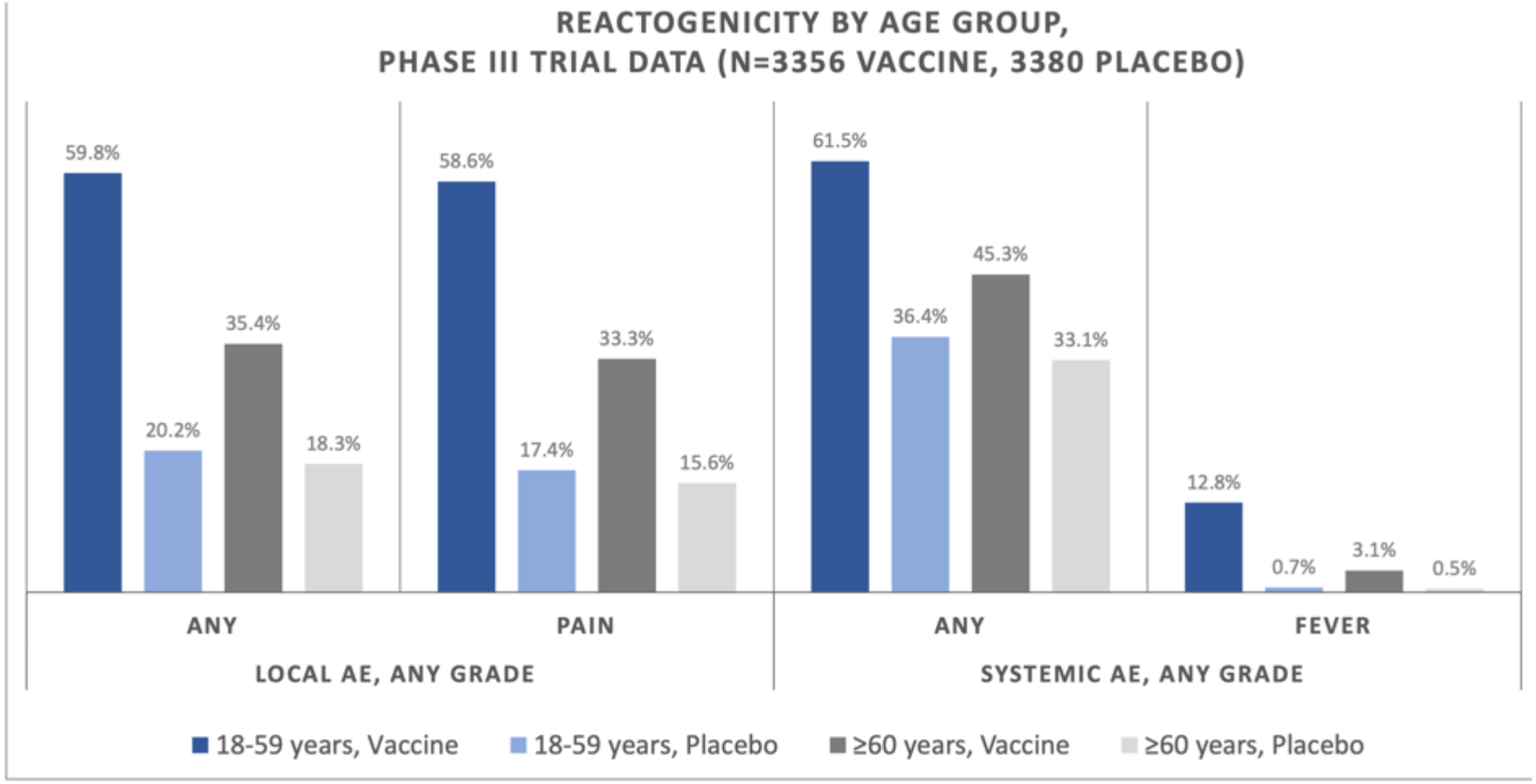
**Similar** efficacy for across age, sex, race, and ethnicity categories, and those with underlying medical conditions at ≥14 days post-vaccination






Source https://emergency.cdc.gov/coca/calls/2021/callinfo_030221.asp

# JANSSEN VACCINE: CLINICAL TRIAL – SYSTEMIC & LOCAL AEs BY AGE




Abbreviations, AE= Adverse Events

Source: https://emergency.cdc.gov/coca/calls/2021/callinfo_030221.asp

# SUMMARY: EFFECTIVENESS PFIZER, MODERNA & JANSSEN VACCINES

- No trials compared efficacy between vaccines in the **same** study at the **same** time
  - All Phase 3 trials differed by calendar time and geography
  - Vaccines were tested against different circulating variants and in settings with different background incidence
- All authorized COVID-19 vaccines demonstrated efficacy (range 65 to 95%) against symptomatic lab-confirmed COVID-19
- All authorized COVID-19 vaccines demonstrated **high** efficacy (≥89%) against COVID-19 severe enough to require **hospitalization**
- In the vaccine trials, **no** participants who received a COVID-19 vaccine **died** from COVID-19
  - The Moderna and Janssen trials each had COVID-19 deaths in the placebo arm

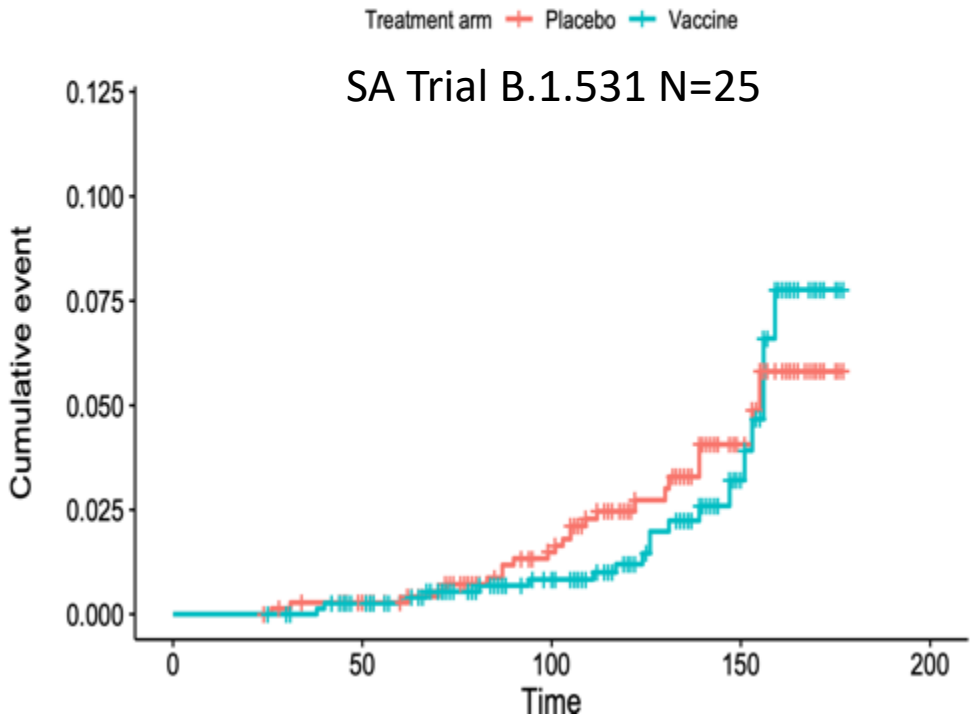
Source: CDC COCO Call 3-3-2021

# VIRAL VECTOR COVID-19 VACCINES

## AstraZeneca/Oxford

- Non-replicating chimpanzee adenovirus
- 2 doses, 4 weeks apart, refrigerator-stable
- 67% effective after 2 doses vs symptomatic disease
  - Booster effect increased if doses spaced by 12 wks or if lower dose used for dose 1
- Effectiveness varies among strains:
  - Effectiveness vs B.1.351 decreased vs <u>all</u> disease; effectiveness against <u>severe</u> disease TBD
  - Distributed in Europe, South Africa, Canada
- Data complexities:
  - Multiple clinical trials; different antigen doses; different spacing of doses #1 & #2; now trials with AZ for dose #1, other vaccines for dose #2

**Figure 3:** Kaplan-Meyer plot of ChAdOx-1 nCoV19 against all-severity symptomatic Covid-19 illness following two doses versus placebo.




**doi:** https://doi.org/10.1101/2021.02.10.21251247

# VIRAL VECTOR COVID-19 VACCINES

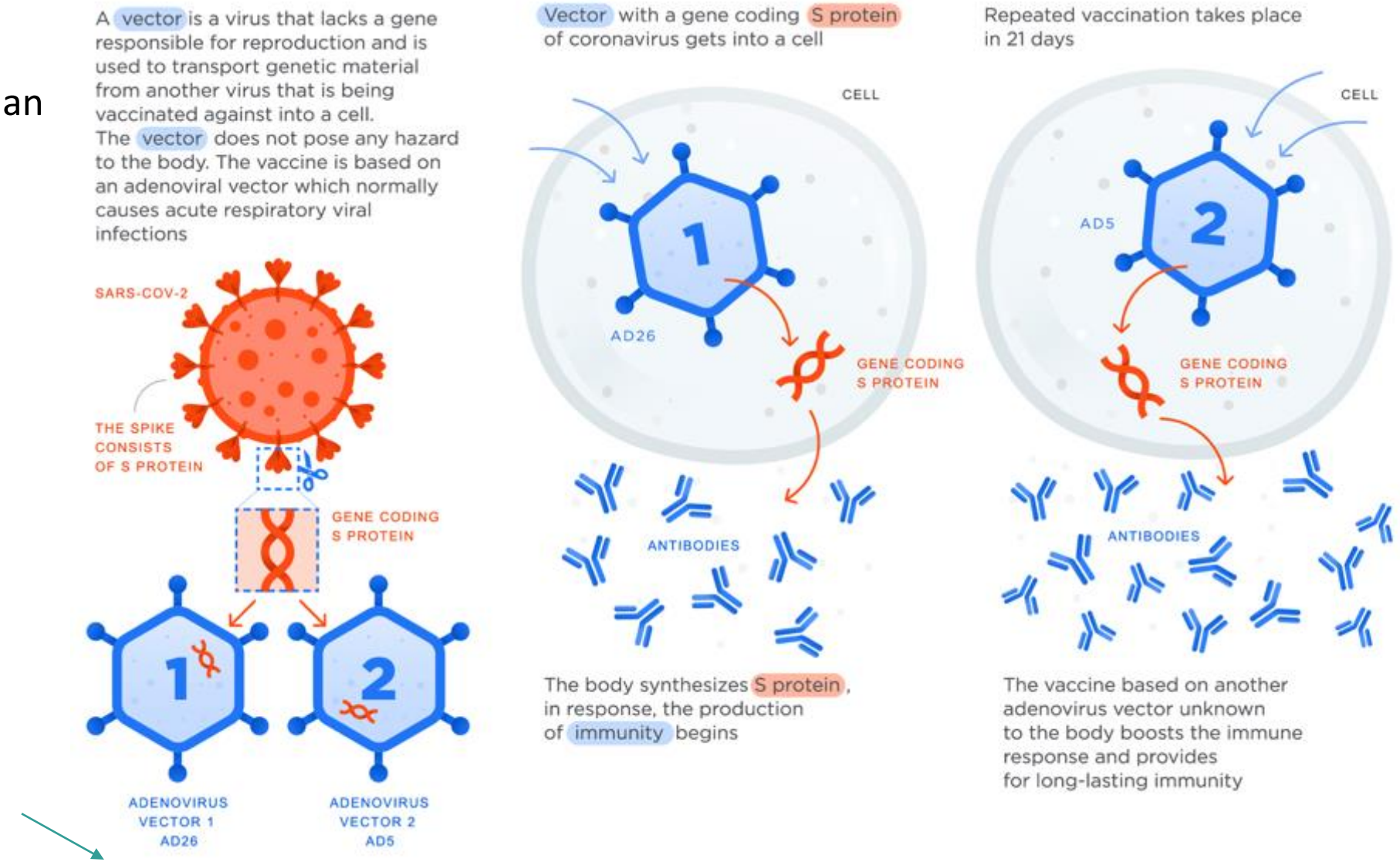
## Sputnik V

Non-replicating human adenovirus vectors

AD 26 dose #1

AD 5 dose #2

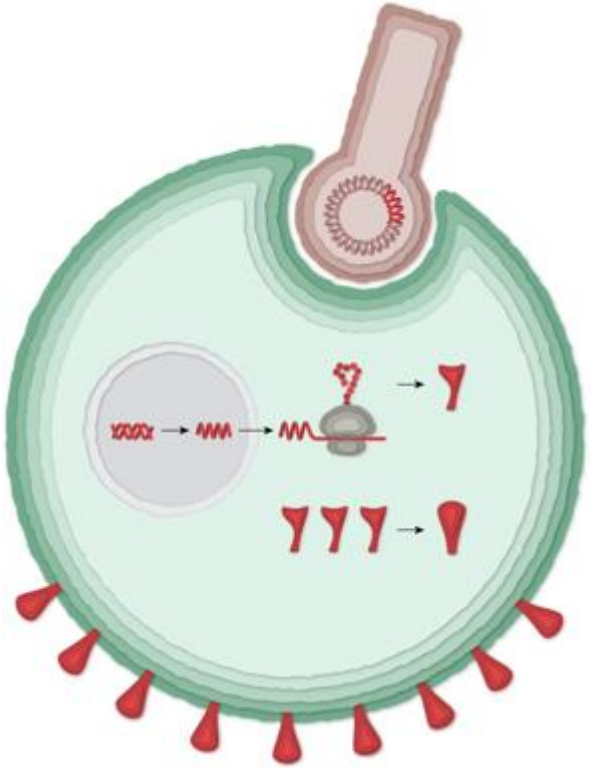
Refrigerator-stable



# PROTEIN COVID-19 VACCINE

## Novavax & Serum Institute of India

- Insect baculovirus contain DNA code for S protein used to infect moth cells
- Matrix M 1 adjuvant (saponin)*
- 2 doses, 3 weeks apart, refrigerator-stable
- Overall efficacy UK 96.4%, South Africa 55%
  - Against severe disease UK & SA: 100%

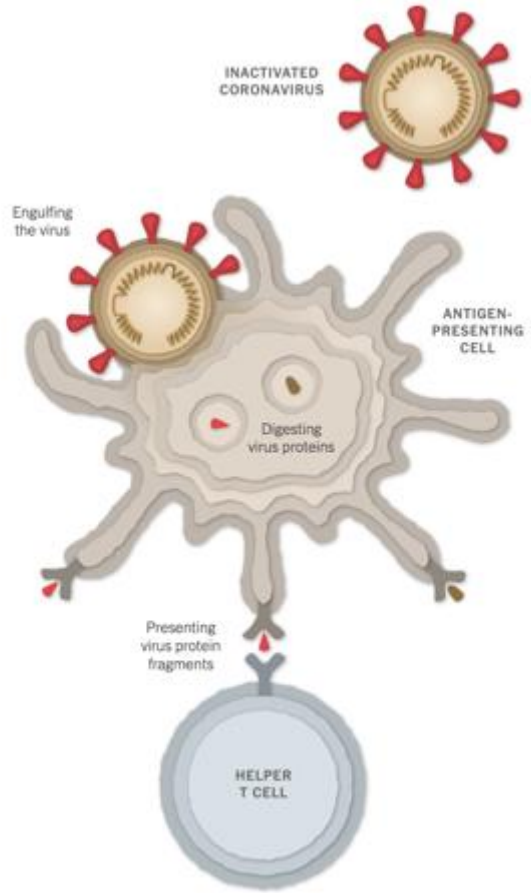


## Others:

Medicago (GSK); ZF2001 (ZVSW China );
Soberna (IFV-Cuba); COVAXX (United Biomedical)

*https://www.sciencedirect.com/science/article/pii/S0264410X16001961?via%3Dihub

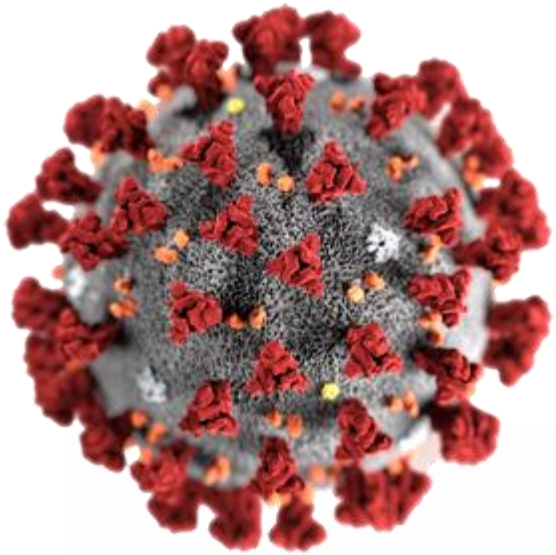
# INACTIVATED VIRUS COVID-19 VACCINES

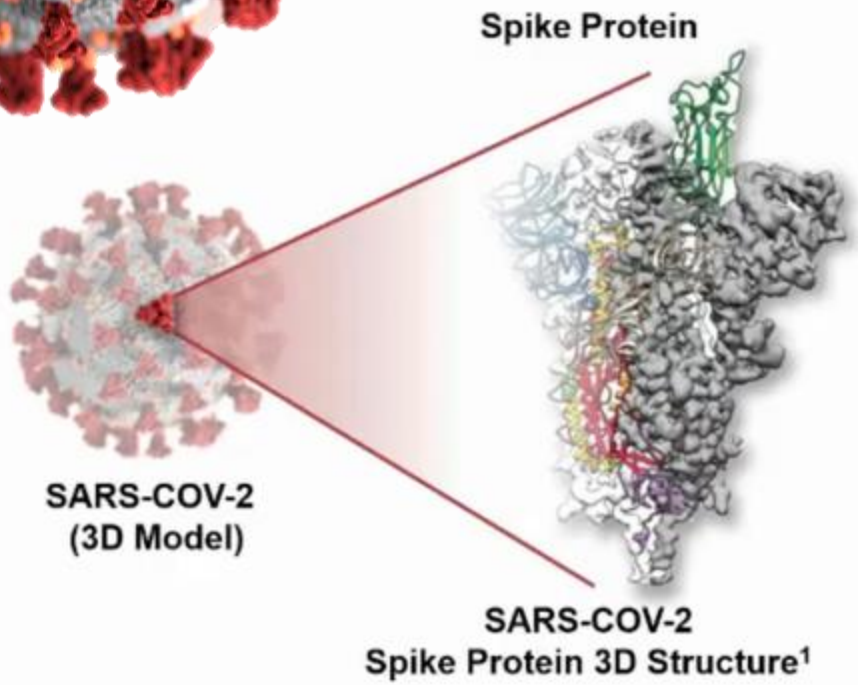



Sinopharm (China)
Sinovac (China)
Sinopharm-Wuhan (China)
Bharat Biotech (India)

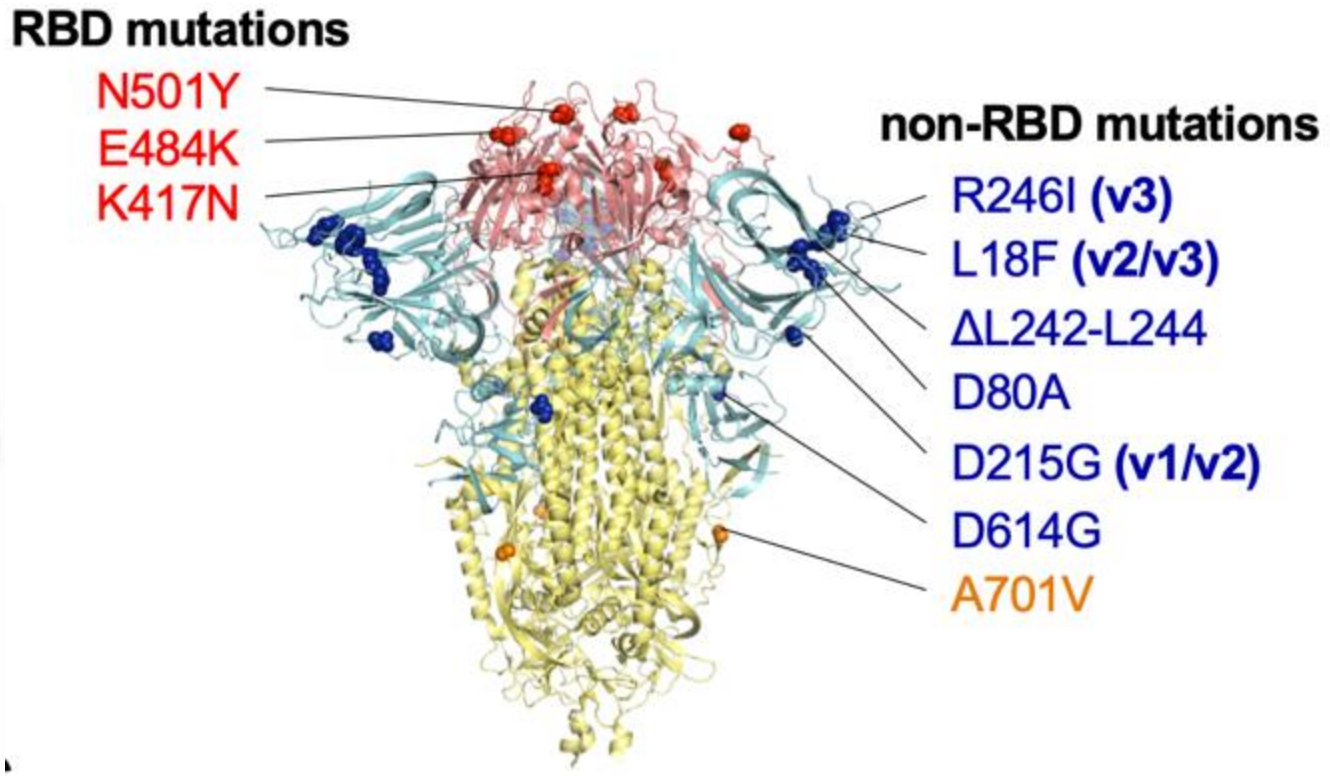
- Various source viruses
- Various methods of viral inactivation

# SARS-CoV-2 S PROTEIN & VARIANTS





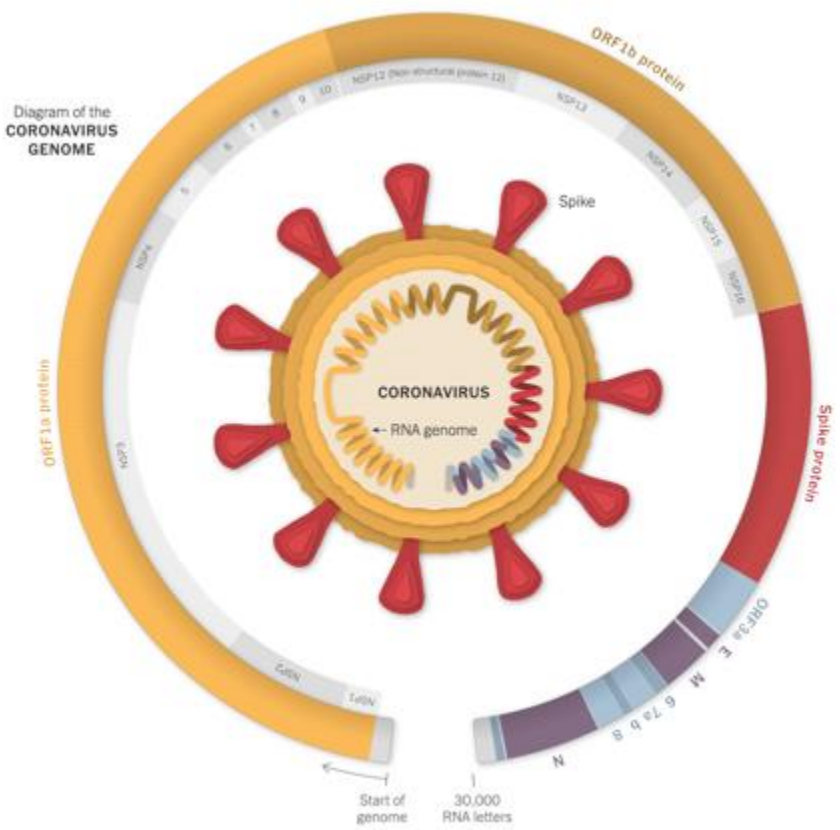

## B.1.351 Variant




RBD – Receptor Binding Domain

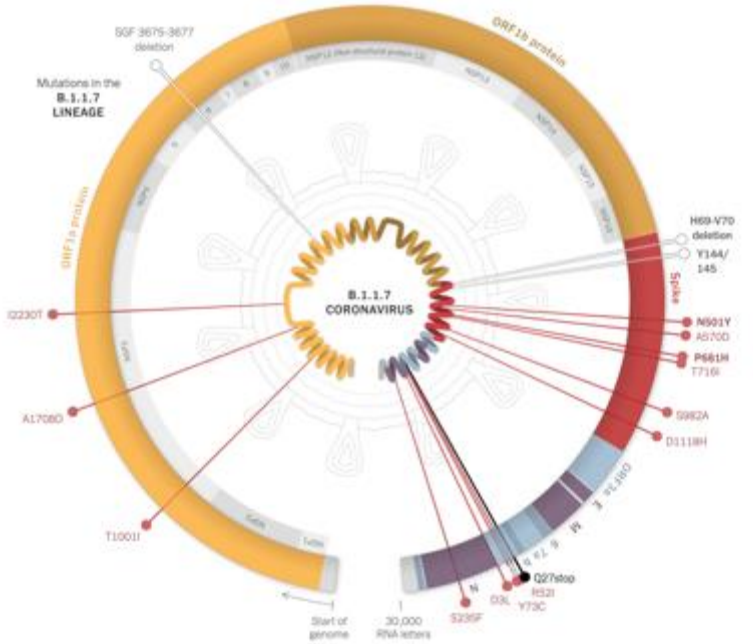
# SARS-CoV-2 S PROTEIN & VARIANTS

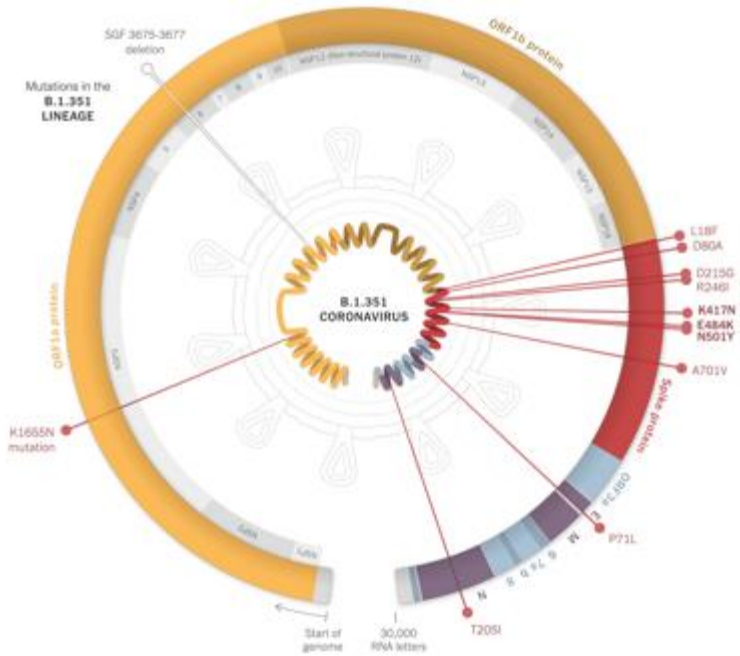
CORONAVIRUS GENOME




- Many variants:  D614G, B.1.1.7 (UK), B.1.351 (SA), P.1 (Brazil), B.1.427 & B.1.429 (CA), others
- Vaccine-induced antibody neutralization varies by strain, relation to efficacy unclear
- CD8+ T-cell responses should recognize variants
- Vaccine efficacy varies between strains
- Vaccines likely protect against severe disease
- Vaccine-induced immunity exceeds immunity provided by infection with prior strains
- Variants do not affect results of diagnostic tests

# SARS-CoV-2 VARIANTS



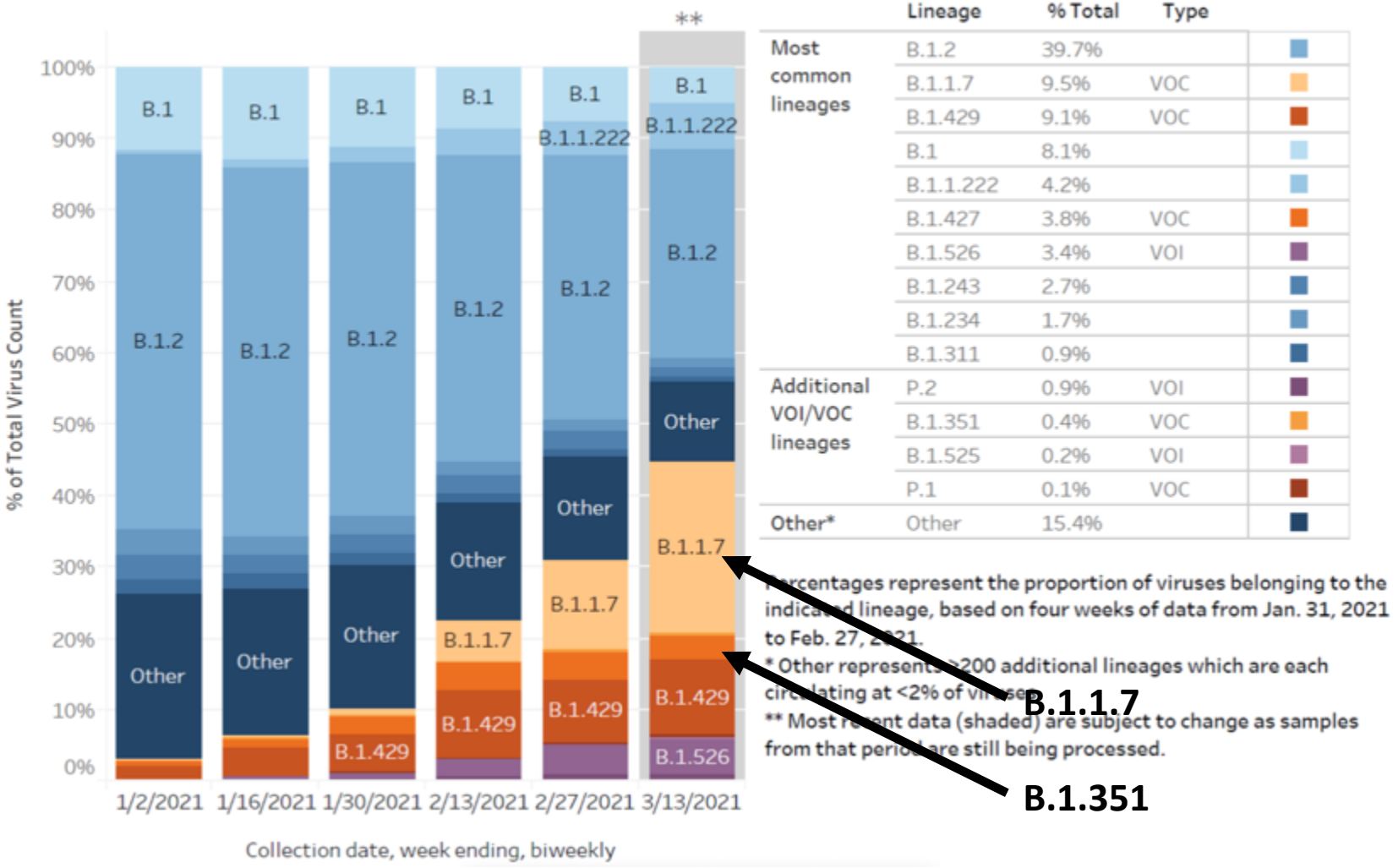

B.1.1.7 (UK)

- More transmissible, ~50%
- Increased virulence – 1.7% increase in death rate
- Vaccines effective

B.1.351 (South Africa)

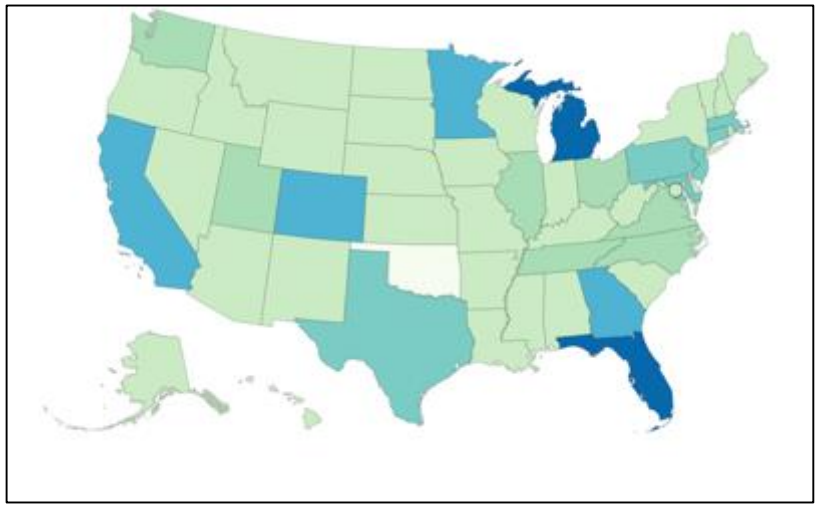
- More transmissible
- Uncertain if virulence changed
- Decreased neutralization by vaccine antibody
- Decreased overall efficacy of current vaccines
- Vaccines protect against severe disease, death

# SARS-CoV-2 VARIANTS CIRCULATING IN US 1/31 -2/27/2021



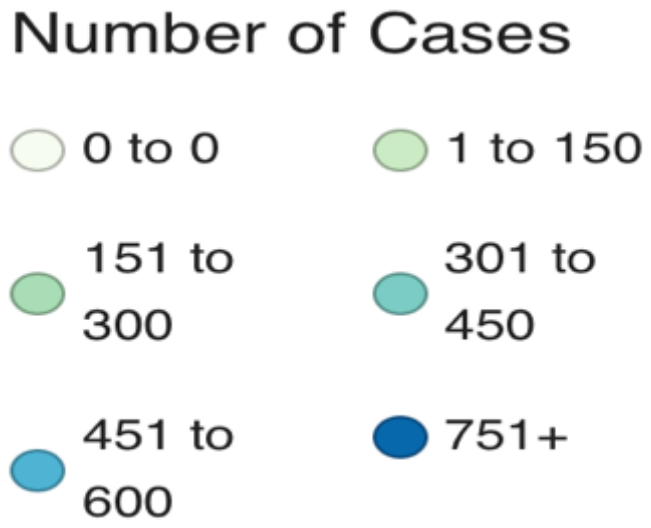
# VARIANTS OF CONCERN US 3-28-2021

B 1.1.7



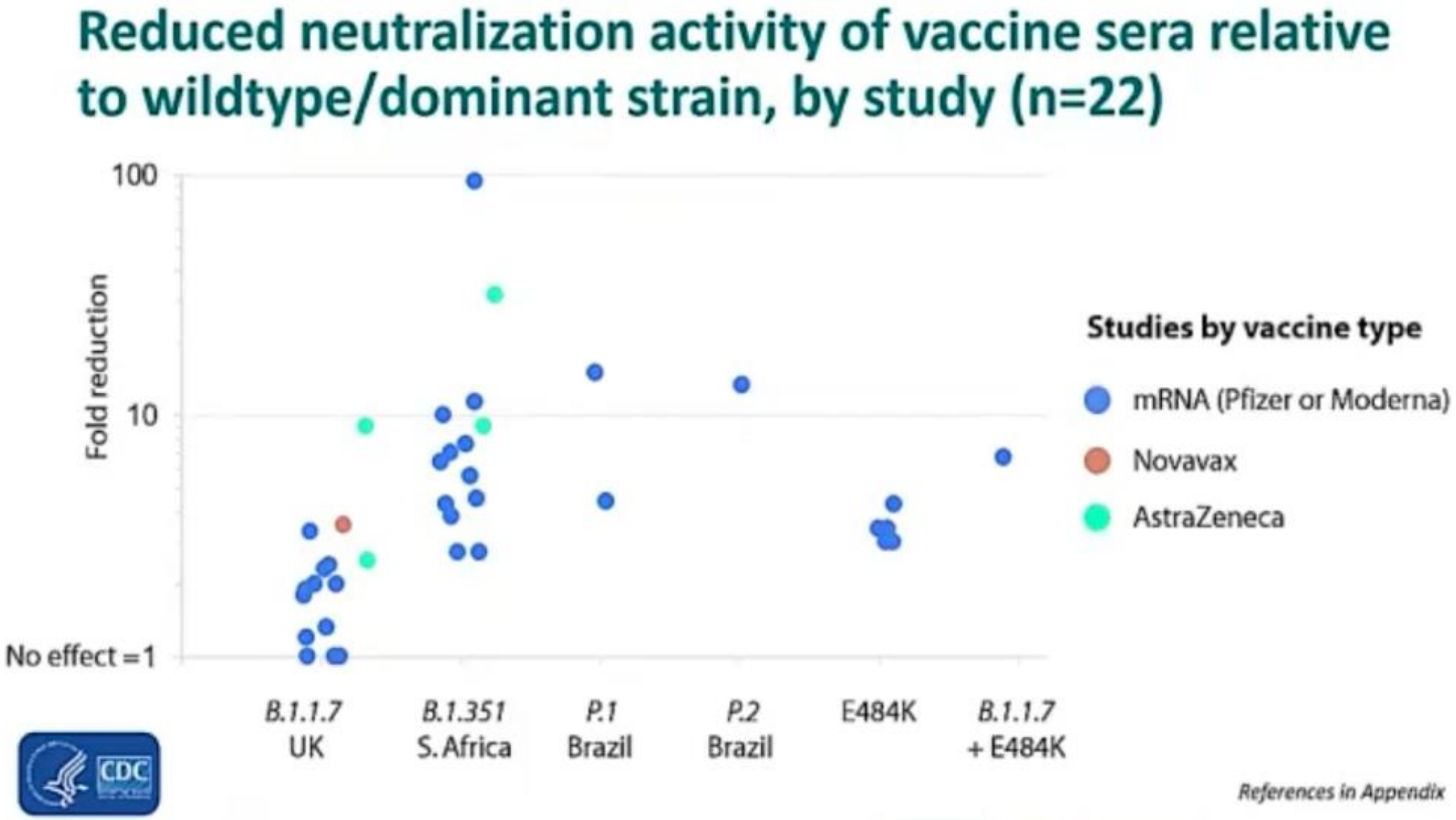
P1.1

B 1.351




https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant-cases.html

# SARS-CoV-2 VARIANTS

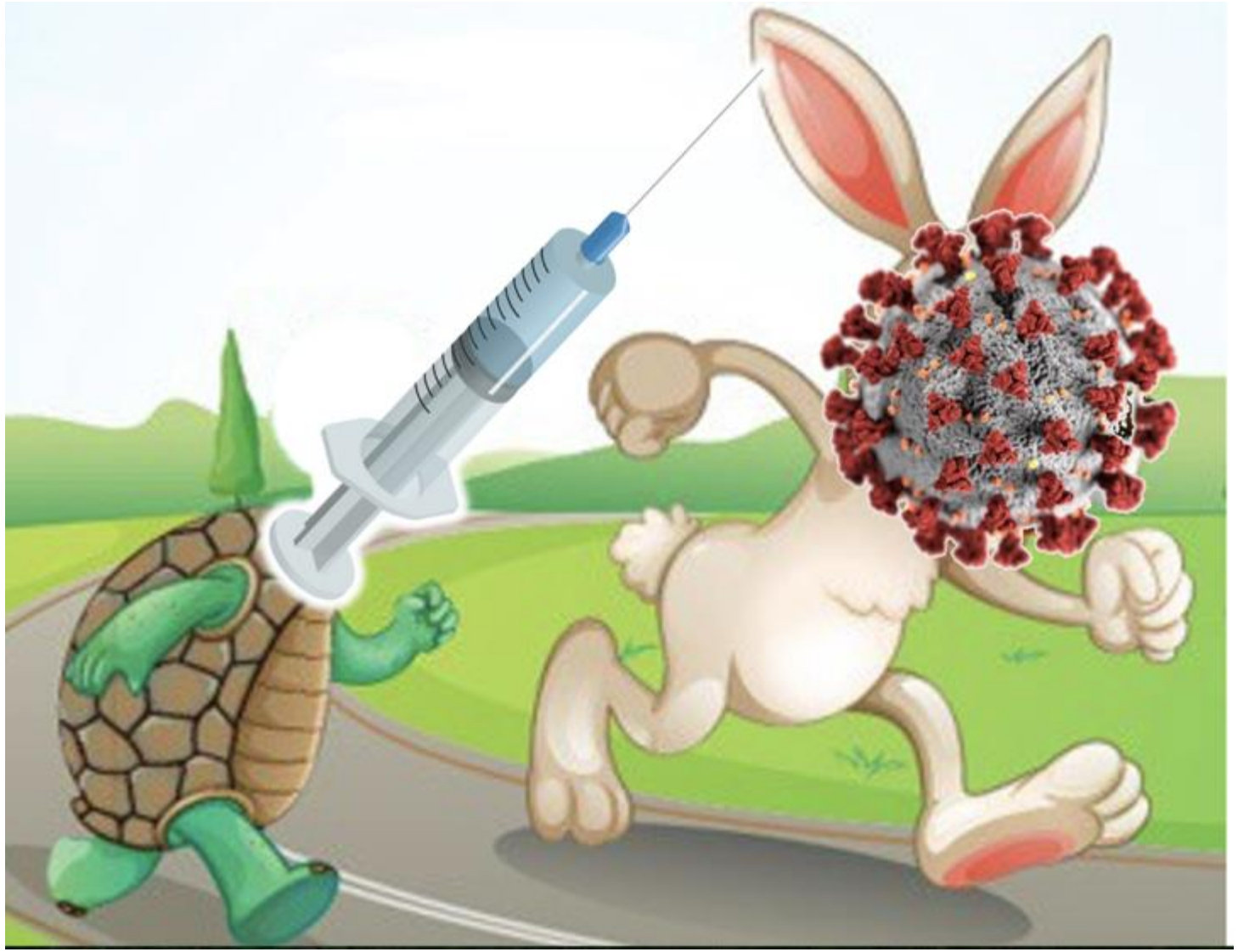


# Vaccine efficacy or effectiveness (VE) against variants

| Vaccine | Study type | VE |
|---|---|---|
| **Pfizer** | Post-licensure | • 86% in UK (predominate B.1.1.7 circulation)*<br>• 94% in Israel (up to 80% of cases from B.1.1.7) |
| **Janssen** | Pre-licensure | • 74% in U.S.<br>• 66% in Brazil<br>• 52% in S. Africa |
| **Novavax** | Pre-licensure<br><br>Pre-licensure | • 96% against non-B.1.1.7 in UK<br>• 86% against B.1.1.7 in UK<br>• 60% in S. Africa (93% of cases from B.1.351) |
| **AstraZeneca** | Pre-licensure<br><br>Pre-licensure | • 84% against non-B.1.1.7 in UK<br>• 75% against B.1.1.7 in UK<br>• 10% against B.1.351 in South Africa |

73-82% for severe/critical disease in each country

# VACCINES vs VARIANTS:  THE TORTOISE & THE HARE



https://tomaspueyo.substack.com/p/variants-v-vaccines?

# COVID-19 VACCINES UNKNOWNS

- Comparative efficacy of mRNA, viral vector vaccines, protein & inactivated vaccines
  - No head-to-head comparison studies on same populations at same time
- Effectiveness of 1 vs 2 doses of 2-dose vaccines
- Duration of immunity
- Relative importance of cellular vs humoral immunity
- Effect on Multisystem Inflammatory Syndrome in Children (MISC)
- Effectiveness & safety in children <12 years

# RESOURCES

- CDC
  https://www.cdc.gov/coronavirus/2019-ncov/index.html
  https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant.html
- WA State DOH
  https://www.doh.wa.gov/Emergencies/COVID19/DataDashboard
- NY Times
  https://www.nytimes.com/interactive/2020/science/coronavaccine-tracker.html
- Washington Post
  https://www.washingtonpost.com/graphics/2020/health/covid-vaccine-states-distribution-doses/
- UW Dept of Global Health
  https://globalhealth.washington.edu/subscribe

# VACCINE RECOMMENDATION UPDATES
# VACCINE HESITANCY

DR. DUNN

# Obtaining Continuing Education

- Continuing education is available for nurses, medical assistants, and pharmacists.
- Successful completion of this continuing education activity includes the following:
  - Attending the entire live webinar or watching the webinar recording
  - Completing the evaluation available after the webinar or webinar recording
  - **NEW: On the evaluation, please check Yes if you're interested in CEs and please specify which type of CE you wish to obtain**
  - CE certificates will be automatically sent via email within a week after evaluation completion
- Expiration date is 1/26/22
- If you have any questions about CEs, email Trang Kuss at trang.kuss@doh.wa.gov

# Questions?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